PUBLIC WORKS

Mar.
1953

CITY, COUNTY AND STATE

John S. Flockhart, Chief Engineer of the Department of Public Works of Newark, N. J., takes a moment to pose for a photograph. More on page 26.

GALION 503 TANDEM DRIVE ECONOMY GRADER

Loaded with "BIG GRADER" FEATURES Priced to fit SMALL BUDGETS

"Big Grader" Features

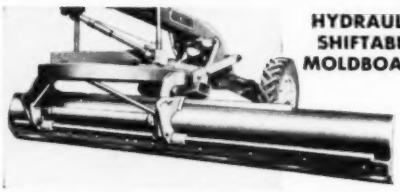
- Hydraulic shiftable moldboard.
- Leaning front wheels.
- Stand-up height cab.
- Front-positioned hydraulic scarifier.
- Diesel engine — 36.7 h.p. (Above features are available as "extras")
- Positive 4-wheel tandem drive.
- Hydraulic controls.
- Gasoline engine — 40 h.p. (std.)
- Four forward speeds, 2.3 to 20.4 m.p.h.; high reverse 4.3 m.p.h.
- Weight (without extras) 8720 lbs.
- Front tires 6.00-20, rear tires 7.50-20, larger sizes available.
- Loader, Windrow Eliminator, "V" Snow Plow, and Bulldozer available.

A WISE and THRIFTY BUY

— for any Contractor, Highway or Street Department. The GALION 503 is compact, rugged, and engineered to do operations usually done with larger and more expensive graders.

Put your road and street maintenance program in high gear with the GALION 503 — and do it without straining the budget! On new construction it will save thousands of dollars in investment and operating costs over the costs with heavier graders.

Write for literature.



HYDRAULIC SHIFTABLE MOLDBOARD

A horizontal travel of 30" provides a 45" maximum reach, right or left, outside the front tires.

FULL-SIZE CAB

All steel and rubber-mounted safety glass. Full height doors. Top half of cab easily removed. Adjustable windshields.

ESTABLISHED 1907

GALION

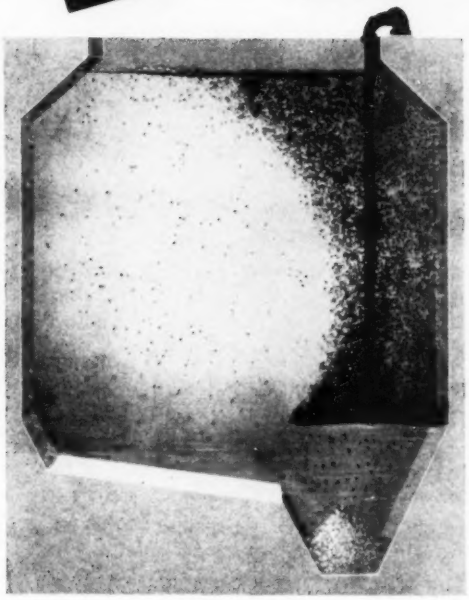
MOTOR GRADERS · ROLLERS

THE GALION IRON WORKS & MFG. CO., General and Export Offices, Galion, Ohio, U.S.A.

Cable address: GALIONIRON, Galion, Ohio

CHICAGO SEWAGE EQUIPMENT

AER-DEGRITTER



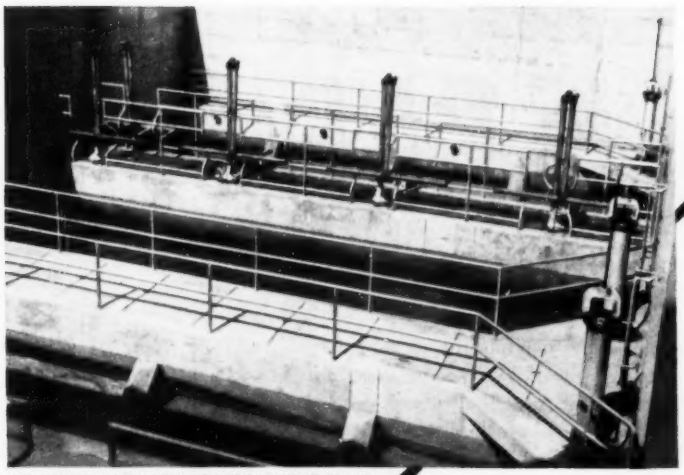
The only method of removing grit and sand from sewage without mechanical equipment is provided by the Aer-Degritter. The velocity of flow is controlled by air introduced through Swing Diffusers and Precision Diffuser Tubes. All sand of 0.2 mm. (65 mesh) and larger is washed and deposited in the bottom of the tank.

Less than 10% volatile matter and only a negligible trace of putrescible organics remains in the grit removed. Aer-Degritters may be installed ahead of all mechanical equipment because coarse sewage material will not interfere with the operation of the Aer-Degritter or affect the hydraulic design of the plant.

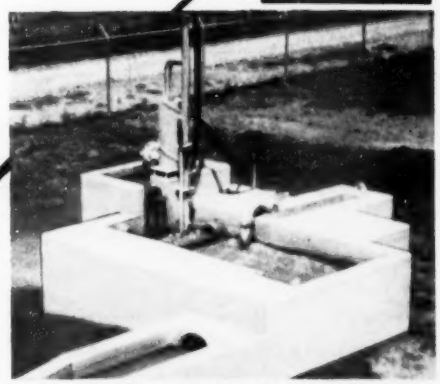
The basic features of the Aer-Degritter are:

- **MAXIMUM REMOVAL**
- **CLEAN GRIT**
- **NO MECHANISM**
- **LOW COST**
- **SIMPLE STRUCTURE**
- **AIR CONTROLLED VELOCITIES INDEPENDENT OF FLOW**

52 INSTALLED IN TWO YEARS



COLUMBUS OHIO SEWAGE TREATMENT PLANT
Design Flow 160 M.G.D.
PAUL A. UHLMANN & ASSOCIATES
Consulting Engineers



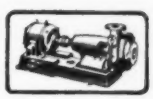
BELLAIRE, TEXAS SEWAGE TREATMENT PLANT
Design Flow .8 M.G.D.
HILTON & COULSON
Consulting Engineers

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

622 DIVERSEY PARKWAY — **CHICAGO 14, ILLINOIS**

Flush Kleen, Scru-Peller, Plunger. Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.



Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

MUD time is CAT time

This Caterpillar No. 12 Motor Grader is doing its job in difficult early-spring conditions in Keokuk County, Iowa. It is one of 17 Cat Motor Graders owned by Keokuk County, which is engaged in an extensive road-building campaign. The County also owns nine Caterpillar D7 Tractors, and a big D8.

Notice the heavy, sticky mud in the illustration. Only a Caterpillar Motor Grader could remain sure-footed under these conditions, because only Caterpillar makes both grader and engine for balanced performance. Reshaping this bank is tricky work, but it's made much easier by exceptional operator visibility, and stability and easy control of the blade assembly. The long-radius side shift rack of a Caterpillar Motor Grader gives added strength and a wide range of blade positions without stopping to change links.

What the picture does not show is the long life and low maintenance cost built into every Caterpillar Motor Grader by precision manufacture, and the fast service and stock of genuine parts offered by Caterpillar Dealers. Your local dealer will be glad to give you a demonstration of the right Caterpillar Motor Grader to fit your requirements.

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

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DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

Public Works ® T. M. Reg. U.S. Pat. Off.

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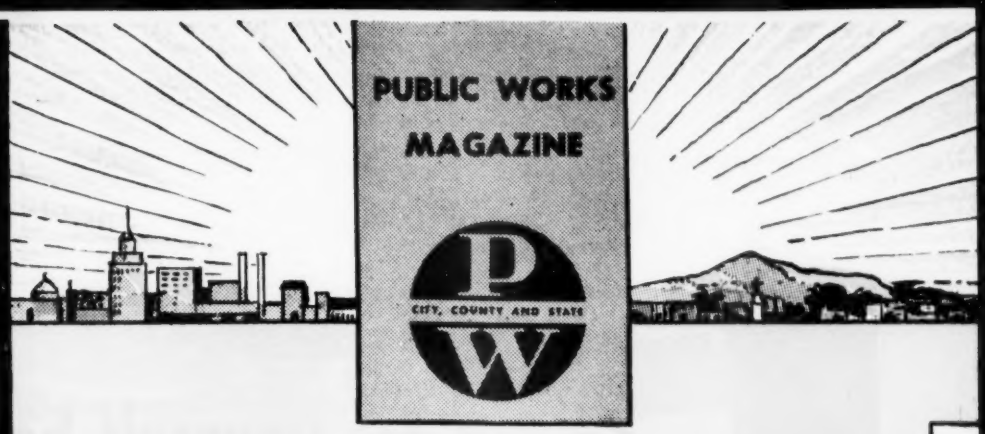


CONTENTS FOR MARCH, 1953

The 1952 volume of Public Works is available on microfilm through University Microfilm, 313 N. First St., Ann Arbor, Mich.

THE EDITOR'S POINT OF VIEW

The Military Reserves and the Engineering Profession

IT has now been more than thirty months since the outbreak in Korea necessitated calling into service a good many reserve officers, mostly or entirely World War II veterans. The experiences during this period have clearly demonstrated that, so far as the usage of engineer personnel is concerned, all of the tinkering and fiddling with the reserve system since the war have failed to improve it one whit. This is probably also true for other professions than engineering.

Scant opportunity for active duty training has been provided—none at all for many groups of engineer specialists who perform important duties during war times. There has been no provision to encourage the entrance into the reserve of young officers of the specialist type. Reserve officers not on active duty have been discriminated against by promotion regulations. That is, a man promoted to major in June, 1945, discharged as a major in December, 1945, and recalled to active duty in December, 1951, was still a major with six months seniority. No credit is given for civilian experience gained during that time. This may possibly be proper for a line officer, who would not gain experience of much value to the army by virtue of civilian employment; but it is not proper for the officer engaged in a profession, such as engineering.

Selection of reserve personnel for specific duties from civilian life has been less than mediocre. Push-button warfare does not work in personnel divisions. You cannot hope to have, when you are dealing with specialized groups, just the right kind of card pop out when you push the button, giving you the best man for that job. It is necessary to add a little intelligence, professional knowledge and hard work to come up with the proper assignment.

What we have said is a boiled down version of our impressions and observations and the information we have been given by men who have been through the mill. It has been an accomplishment to compress our reactions into the relatively small space we have used. To it, we would like to add some recommendations.

First, the general regulations regarding reserve officers should be reviewed by an adequate group consisting of both regular and reserve officers. These regulations should be revised to provide only the general outline of the system to be followed. Specialty boards should then be set up, representing various professions and subdivisions of these professions; and these boards should be charged with preparation of regulations and plans consistent with the overall requirements but designed to provide maximum utilization of the skills they represent.

To provide a flow of young men into these specialized services, and also to overcome one of the serious objections to the present indefinite term appointment, records of all reserve officers should be examined 5 years after appointment and specialists, such as engineers, should be removed from the rolls of the arms and assigned to the specialized groups in which they are engaged. Further reviews, at perhaps 5-year intervals, would be required to assure that a man classed as an engineer, for instance, was still engaged in engineering.

Lots of work? Sure it is; and intelligent work. And that is the only way we are ever going to solve this problem.

George Martin Answers "Doc" Symons' Query on Speed

RECENTLY "Doc" Symons commented in his column that some fifty percent of the drivers on the Parkway in Connecticut travel a few miles over the legal speed limit, which on that section is 55 miles per hour. He asks if the speed limit should not be raised.

We do not think so. In the first place, if the limit were raised, most of those drivers would go just a little higher. It has been quite definitely proven that excessive speed not only increases the accident hazard but also causes more accidents that result in fatalities. High speed also can cause a chain reaction in highway accidents. Something happens to a car and immediately several following cars crash into the obstruction.

Sure, if the road is clear, high speed will probably do no harm on a well designed highway, but when do we find a clear road?

Let's keep the speed limits down to a reasonable figure so that we can all use the roads and expect to get back home safely.

State Capital Capitalizes

1 **PREPARING THE SITE:** The International-Drott Bullclam makes room for the 156 cubic yards of garbage dumped daily by Cheyenne's 26 collection trucks.

2 **CRUSHING, GRINDING NEXT:** A truckload of refuse is dumped and the rugged crawler is right on top, crushing it into a compact layer ready for cover.

3 **CARRYING AND SPREADING COVER:** The crawler bites out loads of dirt and spreads a cover over the freshly crushed garbage. And so the garbage goes underground as soon as it's dumped.

4 **FINISHING THE JOB:** The covering layer is graded smooth and level. Thus Cheyenne's garbage becomes valuable land, soon ready for profitable use.

on Waste

How Cheyenne, Wyoming, uses International Crawler-Drott Bullclam Unit to convert rat-infested open dump to site for future commercial use

CHEYENNE'S BOB ADAMS, shown here with his city's International Crawler-Drott Bullclam unit, has earned the title in the newspapers of "Cheyenne's Leading Clean-Up Man."

Converting a rat-infested open dump into a model sanitary fill that is fast becoming a site for future industry—that's the civic revolution that has taken place since Cheyenne turned its waste-disposal problem over to an International Crawler-Drott Bullclam unit.

Here's the story, in the words of Bob Adams, Cheyenne's Commissioner of Public Improvements:

"Our primary purpose was to eradicate the rats that thrived on the food made available by the open dump. We estimate that we have eliminated between 15,000 and 20,000 rats. In addition, we have eliminated all fire hazard and smoke nuisances connected with the former open dump.

"We now have a sanitary fill equal to the best and in a few years, the city will have a valuable site available for industrial use."

What a job this crawler-bullclam combination does! It's a real one-man sanitation squad —the ONLY one-man unit designed to do the complete sanitary fill job. It prepares the site . . . crushes the refuse . . . carries and spreads the dirt cover . . . then grades the finished area.

It can cut your garbage disposal costs while building valuable land. Drott engineers, with a broad background of experience in municipal sanitary fill, will help you select a site and lay it out and train your operators. The first step in getting information is to see your International Industrial Distributor, or write today to:

DROTT MANUFACTURING CORP., MILWAUKEE 8, WIS.
INTERNATIONAL HARVESTER CO., CHICAGO 1, ILLINOIS

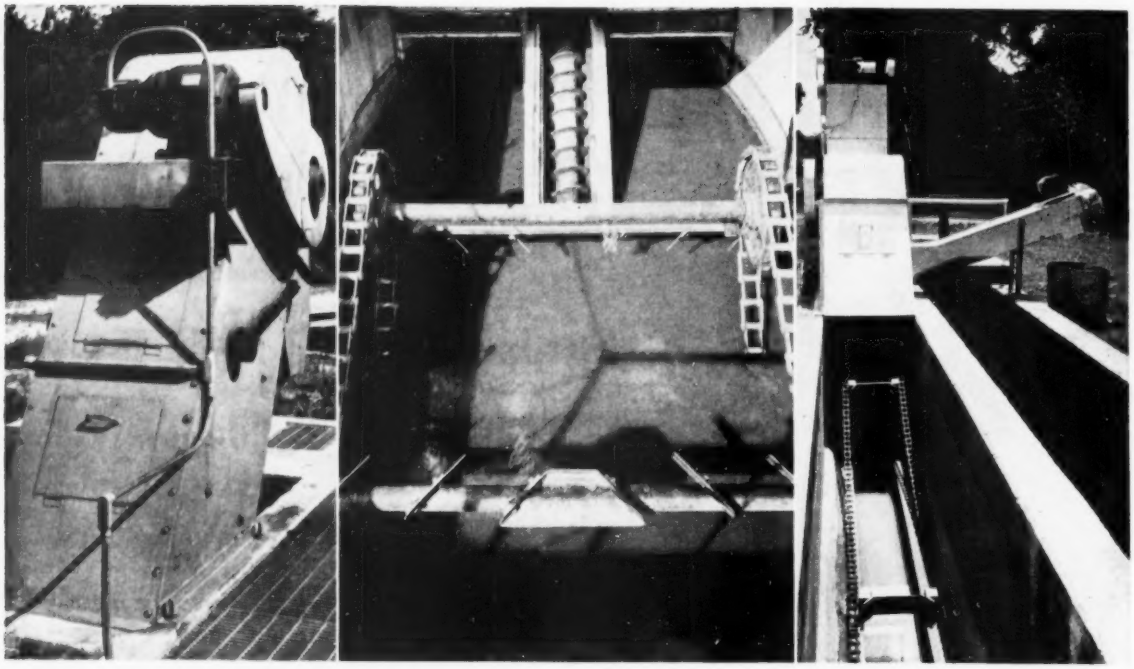
BULLCLAM BY

DROTT

POWER BY

INTERNATIONAL

POWER THAT PAYS



TRITOR SCREENS—At small sewage treatment plants—where grit creates a problem during storm flows, this one machine accomplishes the effective, low-cost removal of both screenings and grit.

STRAIGHTLINE GRIT CHAMBERS—For the removal of a clean, washed grit with a low putrescible content. The complete collection and thorough cleaning operation makes further handling unnecessary.

STRAIGHTLINE GRIT COLLECTORS—On this bucket type collector, water sprays wash the grit from the buckets into a separate washing and dewatering screw. Photo also shows Link-Belt Bar Screen.

How to get flexible, low-cost grit removal

LINK-BELT can give you equipment best suited to your requirements

DON'T let grit plug your pipe lines . . . wear out your pumps . . . take up valuable space in your digesters. Link-Belt builds effective grit removal equipment that assures both low costs and flexibility.

For example, with the Tritor Screen, a grinder may be used to shred the screenings when no grit is received. During storms, the grinder may be by-passed and grit and screenings disposed of by fill, burial or incineration. Similarly, the Straightline grit collector is designed either with a pitched flight collector and dewatering and washing screw discharging direct from the grit chamber—or with a bucket type collector for deep chambers.

In addition to grit handling and washing equipment, Link-Belt manufactures a complete line of equipment for water, sewage and industrial waste treatment plants. A call to the Link-Belt office near you will put you in touch with an experienced sanitary engineer. He'll work with your engineers, chemists and consultants—help you get the best in modern treatment equipment.

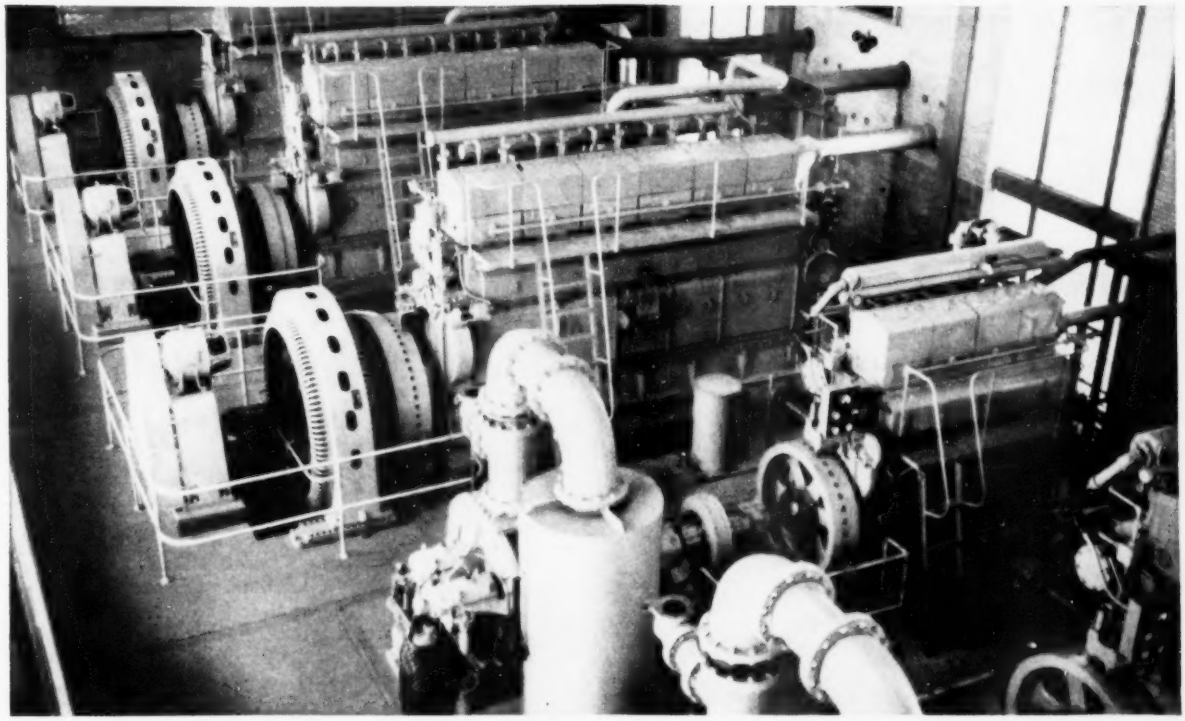
LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities.

13.134

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

Now's the time to mail this month's Readers' Service card.

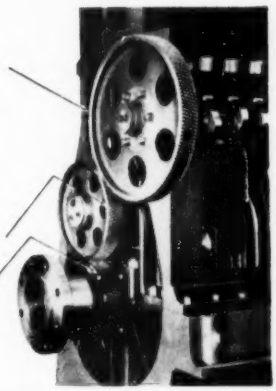


How Worthington Engines helped Boston improve its waterfront sanitation

Thanks to Boston's new Nut Island Sewage Treatment Plant—one of the most modern and efficient in the country—95 million gallons of raw sewage a day will no longer discharge into Quincy Bay. The plant is representative of the fine job being done by Massachusetts' Metropolitan District Commission in keeping clean the harbors and waterfront in the Boston area.

Driving the large blowers used for aeration as well as the generators that supply the plant's electric power are four large Worthington dual fuel engines and one gas engine, totaling 2,916 hp. The dual fuel engines are designed to operate as either gas Diesels utilizing the sewage gas generated in the treatment process, or oil Diesels. Should the gas supply fail in an emergency, the engines will automatically switch to the oil fuel and continue to operate. Four of the plant's main sewage pumps are of Worthington mixflo type, each designed to handle 83 million gallons per day.

Find out how modern Worthington engines—dual fuel, gas or Diesel—can solve your problem. Write, stating requirements, to Worthington Corporation, Engine Division, Buffalo, N. Y



Main camshaft gear. Slots in gear provide single adjustment for retarding or advancing injection timing of all cylinders simultaneously. Final gear adjustment secured with castellated locknuts wired after final tightening.

Free floating idler gear.

Split gear keyed on crankshaft. Permanent adjustment for perfect alignment with idler gear is easily accomplished.

WORTHINGTON HELICAL STEEL GEAR TRAIN

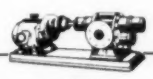
used on these Worthington dual fuel engines . . .

1. Provides accurate and positive control of engine timing.
2. Is located at flywheel end of engine for smooth gear operation as power impulses are absorbed by the flywheel.
3. Uses controlled automatic oil jet lubrication that eliminates wear.
4. Assures correct engine timing . . . keeps engine running smoothly . . . results in best fuel consumption and lowers engine maintenance.

E.2.13

Worthington-Built Auxiliaries

ENGINE STARTING COMPRESSORS



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COOLING WATER CIRCULATING PUMPS

EVAPORATIVE-TYPE ENGINE WATER COOLERS

Economical Continuous Power—Diesel Engines, 150 to 2,100 hp . . . Gas Engines, 190 to 2,100 hp . . . Dual Fuel Engines, 150 to 2,100 hp.

WORTHINGTON

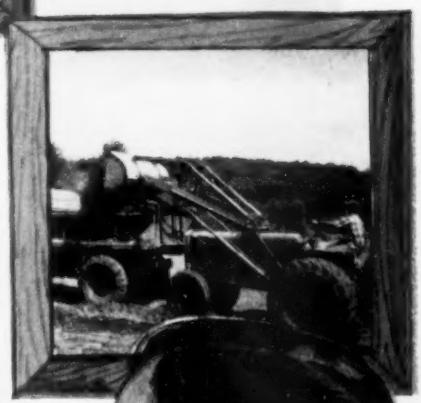
Engines

Get full details of this month's new products . . . mail your **Readers' Service card today.**

DISCHARGE IS FAST OR SLOW,
depending on how you want it. Hydraulic controls make this possible. Mid-section pivot of loader arms give longer reach in dumping position.

STRIPPING TOP SOIL
is another job this versatile unit does well. The simple rugged design of the Ware loader correctly distributes weight on tractor frame, regardless of the operation being performed. Down-pressure can be applied when it is necessary in tough digging. Hydraulic rams absorb shock loads . . . mean longer life and lower maintenance for both tractor and loader.

HYDRAULICALLY CONTROLLED BUCKET
assures greater "breaking-out" action—full bucket loads every time. 28° roll back helps prevent wasteful spillage.



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with this

OLIVER HYDRAULIC Tractor-Loader

An Oliver Industrial Wheel Tractor with this *all-hydraulic* front-end loader is a combination that's hard to beat for low-cost, profitable operation. With any Oliver Wheel Tractor, you get famous Oliver *dependable* plus power, easy maneuverability, rugged construction. With the loader, manufactured exclusively for Oliver Wheel Tractors by Ware Machine Works, you get completely hydraulic operation which means easier, surer control for more efficient digging and loading.

Take a look at the "profit pictures" shown here. They'll convince you that it's well worthwhile to ask your Oliver Industrial Distributor to arrange a demonstration of an Oliver tractor-loader combination for you.

THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Illinois

A complete line of industrial wheel and crawler tractors

Thousands use our Readers' Service card to keep up to date . . . do you?

UP FRONT FOR ADEQUATE ROADS

BY
LEO J. RITTER, JR.
New York University

From Across the Atlantic: If you think diversion of highway funds is a problem in this country, look at the British. It was estimated recently that of some 335 million pounds collected annually from highway user taxes in Great Britain less than 10% is being spent on roads. They do have an idea which, I like, though. That is what they call the "no-claims discount" system. Roughly this means that the driver who is involved in no accidents, or at least who makes no claims, during the year benefits from a reduction (discount) in his automobile insurance premium. One obvious advantage to the insurance companies is that it eliminates small claims; they also think it reduces highway accidents. I do, too.

Wow!: The recently released Report of the President's Materials Policy Commission — "Resources for Freedom" — predicts that by 1975 there will be 85 million motor vehicles registered in the United States, as compared with a present estimated total of 53 million. In 1975 there will be about 20 million trucks compared to the present 9.5 million. We first saw this item in the "Highway Magazine", published by Armco Metal and Drainage Products, Inc.: their very appropriate editorial comment was "Where, oh where, will we put them?" Them's my sentiments, exactly. By the way, this is a very nice little magazine which you undoubtedly can receive free for the asking by writing to their editorial office at Middletown, Ohio. Featured monthly are beautiful pictures of roads and scenery in various sections of the country.

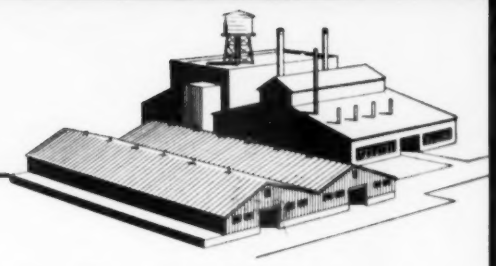
Rutgers: Between 75 and 100 engineers, principally from various governmental agencies, attended the Traffic Engineering Conference which was held at Rutgers University in New Brunswick, New Jersey, on January 29-30. I was lucky enough to be able to attend the first day's session. The program was very well planned and included papers and discussions relative to the traffic problem, traffic studies and analyses, traffic control and regulation, and parking. I particularly enjoyed papers by Theodore M. Matson of the Institute of Traffic Engineers and Yale University, who discussed "The Traffic Problem, Its Nature and Magnitude" and Arnold Vey, Director of the Bureau of Traffic Safety in New Jersey, who discussed the state agencies responsible for various phases of the traffic problem and how information and assistance could be secured from these groups.

Selling the Public: The very attractive illustrated brochures which are such an important part of our No. 1 job—selling the highway program to the public—keep coming across my desk. Latest one is "California's Growing Problem", which is a digest of highway engineering and fiscal studies prepared for the California legislature. Very well done, too.

More Good Ideas: I don't know how many state highway departments and other public agencies are already doing this, but I know that it's a wonderful thing. I am referring to the annual "highway specification" conference between contractors and officials of the New Hampshire Highway Department. A meeting of this sort provides a place for frank and open discussion of specification items which are not satisfactory, for one reason or another, from the viewpoint of the contractor. Advantages should accrue to everybody concerned, including the public. My information about the meeting came from NERBA, the weekly publication of the New England Road Builder's Association.

Along similar lines, E. S. Ward,

(*Continued on page* 86)

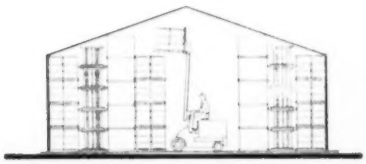
FROM TOOL SHED  TO POWER PLANT . . . 

Butler Buildings Are Your Low Cost Answer to Nearly Every Public Works Building Need!

Chances are you've seen the Butler trademark on many a public works building . . . tool shed, garage, control shack, airplane hangar, warehouse or repair shop. Ever wondered why Butler Buildings make sense to so many municipal officials, engineers and contractors? Let's get down to brass tack reasons. They might well save you a lot of time and money in *your* operation.

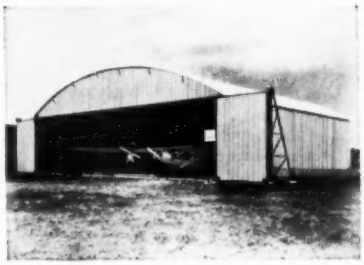
First, of course, is lower cost—Butler Buildings save you up to 50% of the cost of conventional construction. Erection costs are low. No painting or repairs needed. And you save through lower insurance rates.

Now, take a look at the drawing. It shows how the straight sidewalls and trussclear construction of Butler *rigid frame* buildings means *you get*



and use all the space you pay for. Those frames are engineered for greatest strength per pound of steel, too.

Butler Buildings are easily adapted to nearly every public works application. For example, here's a Butler building serving as a civilian airplane hangar in Illinois. Butler Rigid Frame or Bow String Buildings are available in many widths from 20 to 100 feet or wider, with variable lengths. Various window, door, side and endwall arrangements are available. They're easily insulated with low cost materials. Here's how you can combine three Butler Buildings for larger power or sewage plant installations and design the exterior any way you like—it's a Naval Armory in Texas.



Also mighty important for you to know is that Butler Buildings, with galvanized or aluminum covering, are *permanent* buildings (we know of many 40 years old and still in daily service!) which can be easily *dismantled* and *moved* with virtually no added expense.

Here's just a partial list of the many uses for these adaptable buildings:

Airplane hangars
Bus or trolley depots
Filtration plant main or auxiliary buildings
Garages
Highway equipment shelters
Office buildings
Power plant main or auxiliary buildings
Pumping stations
Radio transmitter shacks
Sewage plant work sheds, control shacks
Tool sheds
Warehouses
Weighing stations

You can hardly name an application for which Butler Buildings won't fill the bill and save you up to 50%. Your local Butler dealer will give you prompt, complete planning and erection service on your Butler Building. See him soon!

Straight Sidewalls . . . Get All the Space You Pay For

LET'S TALK IT OVER!

You're under no obligation whatever when you take the next logical step and ask for complete information. We'll be happy to talk over with you a low cost solution to your building problem. Don't wait. Get the whole story on Butler Buildings. Mail coupon right now!

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FARM EQUIPMENT—CLEANERS EQUIPMENT
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☐ Send name of my nearest local Butler dealer
☐ Please send complete information on Butler Buildings for use as_____

Name_____
Firm_____
Address_____
City_____ Zone____ State_____

Smoothest operating and best by far

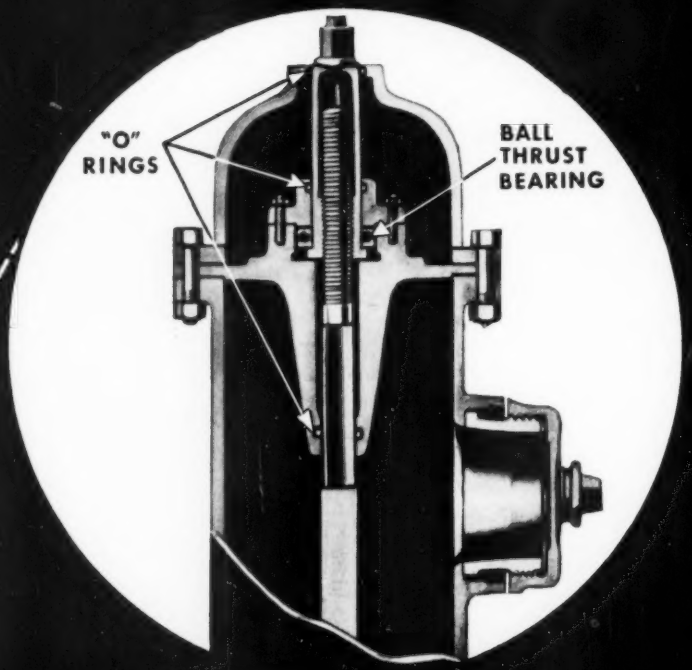

Photo above shows modern, clean-cut design of new Darling B-50-B fire hydrant. As in any Darling hydrant all *inside working parts, including main valve and drain valve parts, can be removed through the top for easy inspection and simplified maintenance.*

DARLING
B-50-B FIRE HYDRANT

THE Darling B-50-B fire hydrant, rated a major advance in hydrant design, eliminates the very things that often lead to unexpected trouble and failure in hydrant operation.

Note that it is *ball bearing* operated, for the smoothest, *surest* action ever! Opening and closing actually takes less than half the usual wrench torque!

Note, also, how the B-50-B design uses "O" ring seals, dispensing with the usual stuffing box, and resulting in a *dry top* hydrant! Moreover, these "O" ring seals not only prevent the loss of thread and bearing lubricant, but never let a drop of water reach the operating threads.

In short, the revolutionary B-50-B not only does away with much bothersome servicing such as gland adjustment, lubrication and packing replacement, but assures fast, easy operation when you need it most!

Before you decide on *any* hydrant, be sure to weigh *all* the advantages of Darling's B-50-B hydrant.

Send for Bulletin No. 5007

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People, Ideas and Events

BY "DOC" SYMONS

H.T.M.A. — And may I say to all of you readers of *Public Works*, who have anything at all to do with the water works industry, for Heaven's sake, don't miss the 72nd Convention of the AWWA to be held in Grand Rapids, Mich., on May 10-15.

★ ★ ★

Who is George Martin? — You may have noted that in the January issue, I mentioned George Martin of Green Bay, Wis. and in the same issue, you read that George Martin of New York City has become Highway Editorial Consultant to *Public Works Magazine*. Let's differentiate a few George Martins:

There is George E. Martin, formerly Cons. Eng. to the Barrett Co. of New York City and now Highway Editorial Consultant to Public Works; George N. Martin, Vice Pres., Bates and Rogers Co., Contractors, Chicago, Ill.; and George W. Martin, Supt., Green Bay, Wis., Metropolitan Sewer District. Then there are five other George Martins (including a George E.) who are all members of the American Chemical Society and presumably chemists of some kind; and there's still another George E. Martin of Pittsburgh—he's a doctor, medical variety.—Now are you confused?

★ ★ ★

Swedefinitions — A *bolt* is a thing like a stick of hard metal such as iron with a square bunch on one end and a lot of scratching on the other and a *nut* is just like a bolt only opposite, being a hole in a little square bunch of iron sawed off short with wrinkles around the inside of the hole.

★ ★ ★

If This Be News — The N. Y. Sect. AWWA held its annual mid-winter Luncheon Meeting on Jan. 20. Considering that the vast majority of that group hadn't backed a winner for 20 years, it was surprising to see so many whose loyalty to AWWA outweighed their interest in proceedings inauguralwise.

Biggest news event of that meeting was the announcement that the N. Y. Section had selected Harry E. Jordan for the Fuller Award for his 50 years of service to the water works industry. The AWWA Board Members who were guests at the luncheon presented a citation to Rollo Blanchard, V. P. of Neptune Meter Co. and longtime Secretary of the N. Y. Sect. Morrison B. Cunningham of Oklahoma City, Okla., took a bow as President Elect of AWWA and Dale Maffitt of Des Moines, Iowa, bowed too, as AWWA Vice Pres. Elect.

★ ★ ★

Luminous Quote— "Industry should approach the water problem with a three part integrated study and program—source of supply, use and reuse, and disposal of wastes." So spoke Ken Watson, Coordinator of Industrial Waste Treatment, Manuf. Serv. Dept., General Electric Co., in a hotel lobby discussion at the annual meeting of the NYSIWA in N.Y.C.

★ ★ ★

Too Bad — At the Operators' Symposium on Sludge Digestion held during the NYSIWA Meeting in January, the proponents of Bionetics, Enzymatic, and C-Kal missed an opportunity to answer questions on the use of these new trace materials that are proposed for the solution of many sewage treatment problems. They also missed an opportunity to reply to many adverse criticisms that were brought out.—Too Bad!

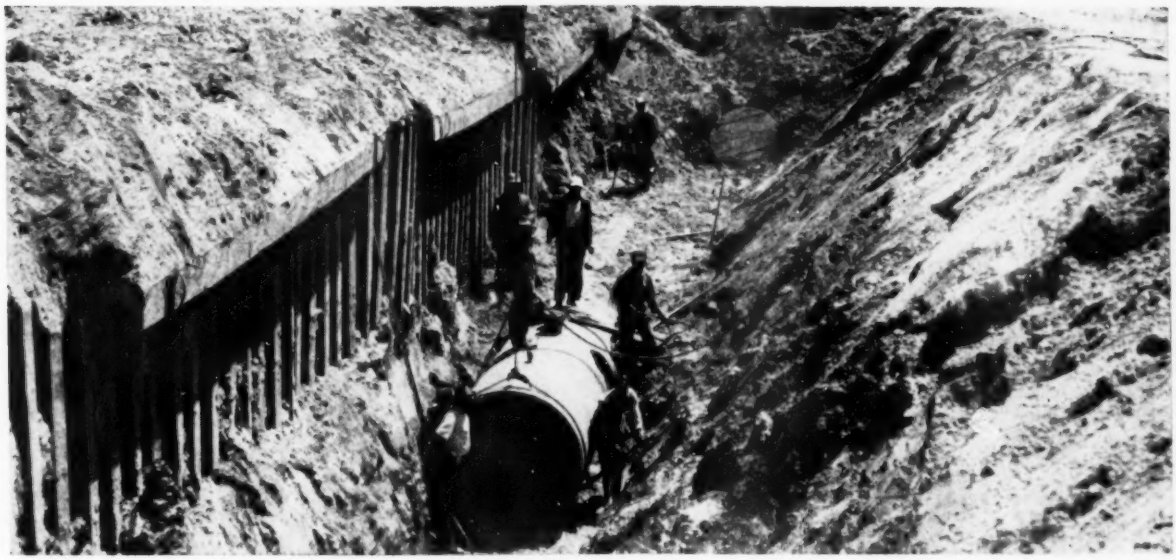
★ ★ ★

It's News To Me — The Water & Sewage Works Manufacturers Assn. was founded in May 1908, with 11 member companies.—*Public Works Magazine* joined in 1921 and was the 50th member, (the third magazine). Membership now in WSWMA is 188.

★ ★ ★

"Who Hoppen?" — Right after the 25th Anniversary Meeting of the Federation of Sew. and Ind. Was. Assns. in New York last October,

(*Continued on page* 114)



IN BUILDING SEWERS FOR THE YEAR 2000 TAMPA, FLORIDA CHOOSES *CONCRETE PIPE*

To eliminate dangerous and obnoxious pollution in the Hillsborough River and adjacent bay waters, Tampa, Fla. built an extensive new sewage system. Planned for the future, the system is designed to serve an expanding metropolitan area population that is expected to reach 335,000 by the year 2000, nearly triple Tampa's present population.

The new facilities include intercepting sewers, pumping stations, force mains, lateral sewer extensions, six crossings beneath river and harbor channels, a sewage treatment plant with a 36 mgd primary treatment capacity and a subaqueous outfall.

This huge system was built by several contractors. Greeley and Hansen of Chicago were the engineers for the entire project. Sizes and quantities of concrete pipe used are listed below.

Like Tampa, hundreds of other American cities have selected concrete pipe for dependable, economical sewer service. In many of these cities concrete pipe sewers have rendered ***low-annual-cost*** service for 70, 80, 100 years and more.

Concrete pipe has solved numerous difficult sewer problems because it has (1) the strength to withstand severe impact and to sustain heavy overburdens, (2) the smooth interior surface to resist abrasion and provide maximum hydraulic capacity and (3) the uniformly dense structure and tight joints to insure minimum infiltration and leakage.

Because concrete pipe is moderate in first cost, requires little or no maintenance and lasts so long, it delivers ***low-annual-cost*** sewer service. That is appreciated by civic officials and taxpayers alike.

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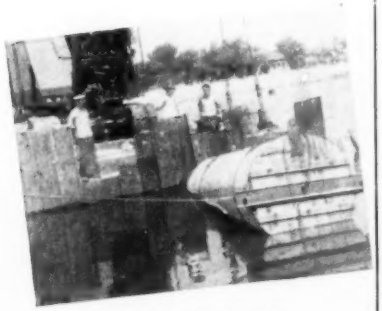


48 in. concrete pipe being lowered for channel crossing

CONCRETE PIPE USED IN TAMPA SEWERS

13,500 ft.	60 in.	2,400 ft.	42 in.
16,300 ft.	54 in.	2,800 ft.	36 in.
21,000 ft.	48 in.	13,400 ft.	30 in.
2,900 ft.	27 in.		

CONCRETE PIPE IN SUBAQUEOUS OUTFALL

3,750 ft. 78 in.

CONCRETE PIPE IN RIVER AND CHANNEL CROSSINGS

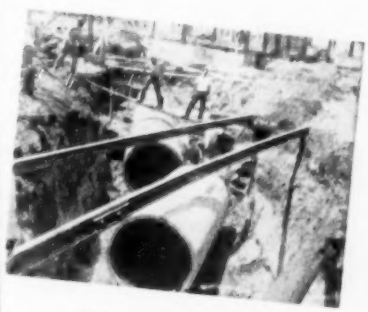
1,475 ft.	48 in.	320 ft.	36 in.

CONCRETE PIPE IN FORCE MAINS

9,100 ft.	54 in.	250 ft.	48 in.
3,900 ft.	30 in.		

CONCRETE PIPE IN TREATMENT PLANT

1,650 ft.	84 in.	200 ft.	72 in.
215 ft.	54 in.		



54 in. concrete pipe being placed under railroad switch tracks

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Another CITY CHOOSES THE 4-WHEEL DRIVE Oshkosh

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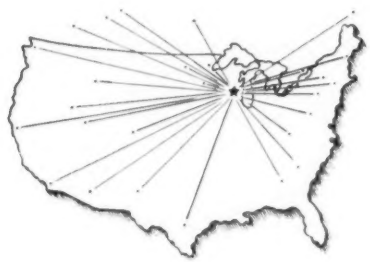

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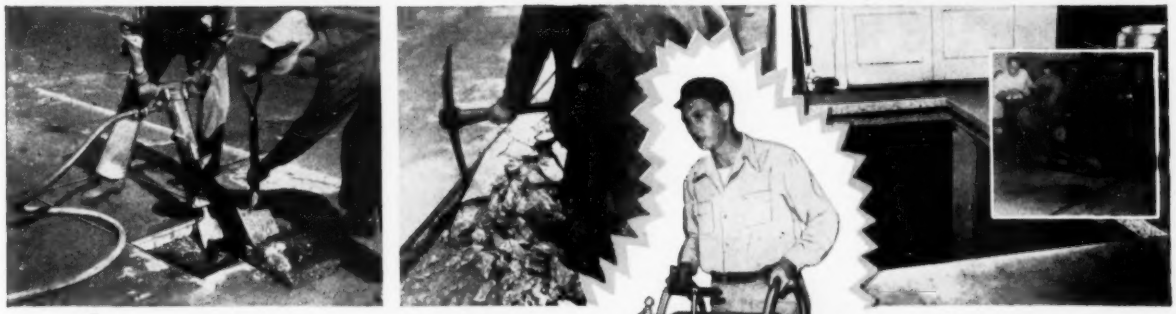

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Save up to 50% in labor and material. Saw repair patches—water, gas, sewer and air line trenches in floors, streets, walks, runways and highways. Save, too, by sawing contraction joints—eliminate costly hand forming and spalling.

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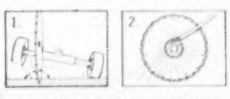

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BOOKS IN BRIEF

HYDRAULIC RESEARCH

Hydraulic Research in the United States is compiled from reports on current projects by 100 hydraulic and hydrologic laboratories in the US and Canada. 200 pages. Refer to National Bureau of Standards, Miscellaneous Publication 205. $1. Government Printing Office, Washington 25, D. C.

PRESTRESSED CONCRETE

This "Stressteel Manual" deals especially with a new type of steel bar of extremely high strength for use in concrete. The 60-page book covers applications, design, materials, specification and construction procedures. Write for your copy to Stressteel Corp., 207 East 37th St., New York 16, N. Y.

THE MARYLAND ROAD TEST

Here is the complete history of the Maryland Road Test from the beginning to the end, with a detailed report of the findings. 142 pages plus several appendices. Price $2.25 from Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

TRAFFIC ENGINEERING

Proceedings of the Fourth California Street and Highway Conference are now available. There are 29 papers, 129 pages, paper bound. $1 from University Press, Berkeley 4, Calif.

SCREEN AND GRINDER

This is an excellent booklet which tells and shows how the Dorr bar screen and the Sulzer screenings disintegrator work together. Phantom and cutaway views show the insides of a combined unit, with the surrounding concrete structure. There are also engineering drawings and photographs. You can get your copy by writing to Dorr Co., Barry Place, Stamford, Conn..

CITY PLANNING

Two books will be published in March: Urban Redevelopment, Problems and Practices; and The Future of Cities and Urban Redevelopment. Both are edited by Cole-

man Woodbury. The first-mentioned book will sell for $7.50; the other for $9. They are published by the University of Chicago Press, 5750 Ellis Ave., Chicago 37, Ill.

GAS PIPE SAFETY CODE

American Standards Association, 70 East 45th St., New York 17, N. Y., has approved a safety code for gas pipe lines and distribution systems, covering material, design, fabrication, installation, testing and operation. This is Section 8 of B31.1c-1952. Copies are available from the Association.

COMMUNITY GROWTH

This "Guide to Community Growth" is the general land use plan of Johnson City, Tenn., and it contains much of value to planners. It is published by the Tennessee State Planning Commission, 517 Commerce St., Nashville 3, Tenn., and sells for $1.

INDUSTRIAL LIGHTING

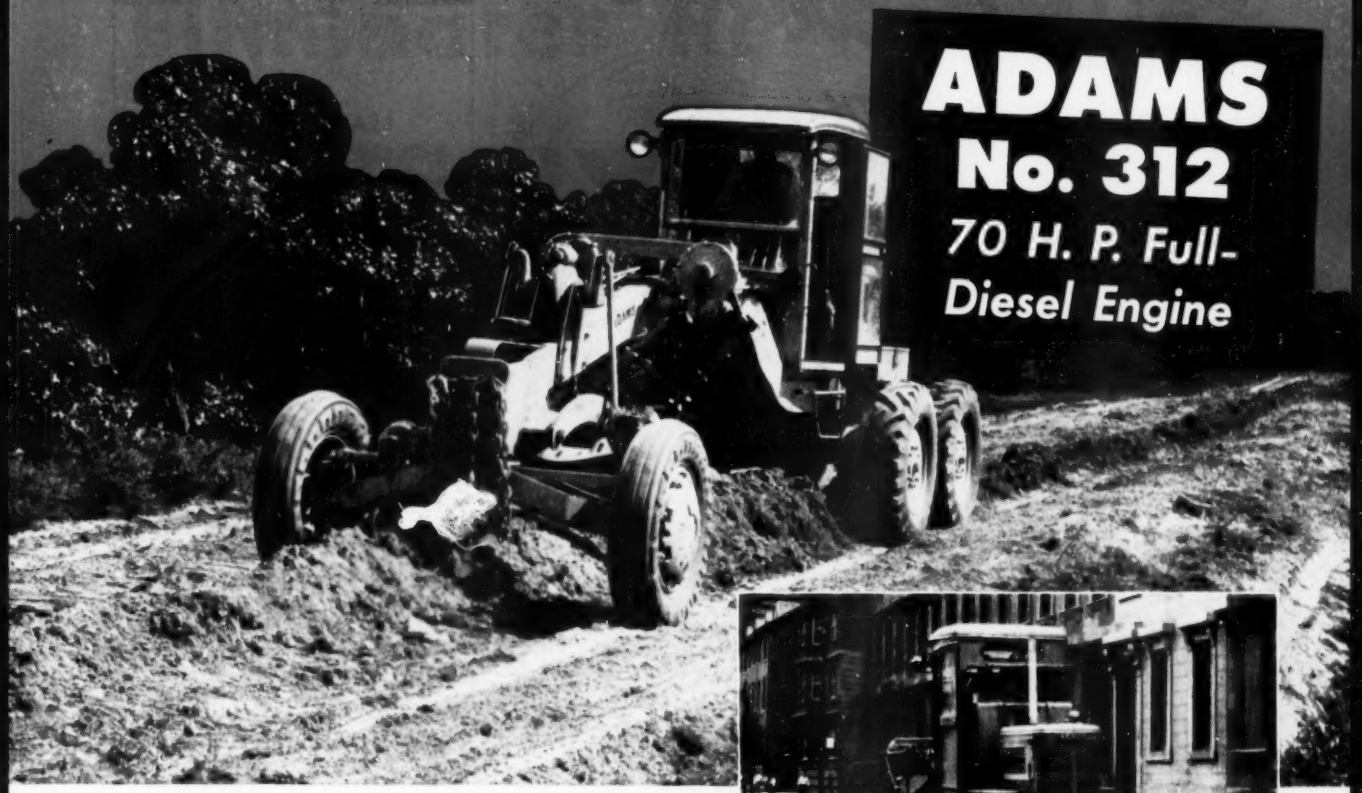
The 1952 Edition of the RLM Standard Specifications contains detailed specifications for 18 of the most commonly-employed incandescent and fluorescent industrial lighting units, as well as new lighting data. Sent on request to RLM Standards Institute, 326 W. Madison St., Chicago 6, Ill.

• • •

Boars Will Hold Meeting at Miami FSIWA

The Order of the Boar, famed organization of the old Sanitary Corps, will hold a meeting, initiation and dinner on Wednesday evening, October 14, during the annual convention at Miami, Fla., of the Federation of Sewage & Industrial Wastes Associations. With the cooperation of the Federation, other events for that evening will be held to a minimum. Joe Gilbert of Link-Belt Co. has promised to bring The Boar to Miami so that a full-fledged initiation will be possible. Qualified sanitary engineers and men active in that field are eligible for membership into this unique order which has no initiation fees and no dues. The only monetary cost will be the actual charge for the dinner. Dinner tickets will be available at the Link-Belt booth in Miami, or write J. J. Gilbert, Link-Belt Co., Box 472, Lansdale, Pa., for advance reservations.

Looking for a Medium-Priced Motor Grader with Big Capacity? — Investigate the



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LEADERS IN THE PUBLIC WORKS FIELD

★

John S. Flockhart (see the front cover of this issue) is Chief Engineer of the Department of Public Works of Newark, N. J. He is a civil engineer graduate of Brooklyn Polytechnic Institute and has been with the City of Newark since 1921. He started on that career as an engineering draftsman and has risen through eight grades to his present position. On the way up he has become recognized as one of the outstanding engineers in the field of public works. His present duties include supervision of the Bureaus and Divisions of Water, Sewers, Streets, Surveys, Lighting, and other administrative sections.

He has been active in the American Public Works Association and was President in 1940. Also he is a member of ASCE, AWWA and ARBA. He was an Expert Consultant on the Survey, in 1945, of Waste Disposal Problems at Army Posts and was chairman of the APWA Committee which developed the Manual of Street Cleaning Practice. At present, he is engaged in planning for a 750-ton incinerator, in addition to his other duties.

His hobbies are golf and work, but he notes that he "plays" at golf. He does not say what all who know him appreciate——that he works hard and long; and in the process is adept at getting things done the right way the first time. His long record of meritorious public service is a testimonial alike to himself and to the City of Newark.

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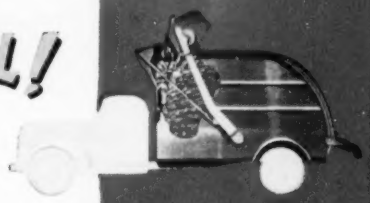
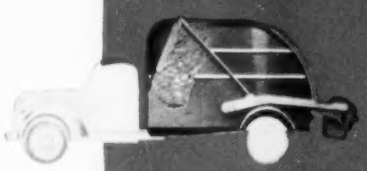


Cut-away view showing bucket dumping and packer plate in open position. As bucket lowers, packer plate compresses load.



Cut-away view shows packer plate in closed position. Material is being compressed toward rear of body to eliminate waste space.

GB-1

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Balanced W-type 2-stage compressor in every size from 75 to 600 ft.

75% to 100% larger valves than in older type machines.

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Bigger intercoolers and air receivers. Relief valve for automatic drainage standard in all models.

Bigger engines operated at conservative speeds, and bigger multiplate clutches than on any other compressors.

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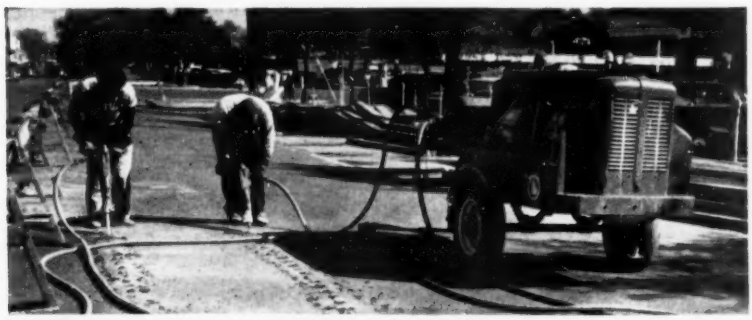
Ask your Jaeger distributor to prove this. Or send for Catalog JC-1, which gives full data on compressors, tools and their air requirements — facts not published in any other catalog.



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Jaeger Model 250 — the first compressor to operate a 3½" wagon drill or 2 heavy rock drills efficiently.

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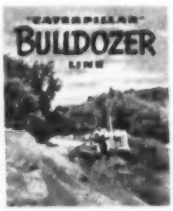
Theory and Application Of the Flow Tube

84. Hydraulic formulae, head capacity curves and test data for this primary metering element are given in a technical bulletin, "Theory and Application of the Flow Tube," available from Foster Engineering Co., Union, N. J. Check the coupon for a copy.

What You Should Know About Use of Power Cranes and Shovels

89. A series of eight articles discussing the use and application of power cranes and shovels has been compiled under one cover by the Koehring Co., Milwaukee 16, Wis. This 32-page booklet covers the basic principles of operations and cost, safety consideration and factors to consider in equipment selection. Get your copy of this valuable booklet by checking the coupon.

"Encyclopedia" on Bulldozers



97. Every size and style of bulldozer made by Caterpillar Tractor Co., Peoria 8, Ill. is shown in a 36-page booklet, Form 30461. Cutaway views showing details, important components of hydraulic and cable controls, attachments such as brush, root and rock rakes, treedozers and stumpers are also included. Get this interesting publication by checking the coupon or write direct.

Booklet Describes Prestressed Design

170. The services of the Preload Company, Inc., 211 East 37th St., New York 16, N. Y. include complete designs and specifications for prestressed construction of linear and circular structures. In an attractive new booklet a number of outstanding prestressed structures are described and illustrated, and details are supplied on several prestressing systems. You can get a copy of this interesting booklet by checking the coupon.

How Prepakt Concrete Repaired a Sewage Treatment Plant

98. Extensively deteriorated walls and beams of a sewage treatment plant that had lain idle for several years were restored with high density Prepakt Concrete. The story of this project, profusely illustrated, appears in an issue of the Prepakt Reporter, published by The Prepakt Concrete Co., Cleveland 14, Ohio. Check the coupon for a copy.

Helpful Manual on Bodies and Hoists

101. The Heil Body and Hoist Manual is a handy 68-page booklet designed to furnish all information needed for selection of the correct body and hoist unit for your needs. Body and hoist features, payload distribution, hoist capacities and full operating and maintenance instruction are a few of the items covered in this comprehensive manual. Check coupon or write The Heil Co., Milwaukee, Wis.

Faster Compaction On Street Repairs

108. Holes and trenches cut through pavement present difficult areas for compaction of backfill. Learn how to do the job quickly, easily and cheaply by using the self-contained, portable Barco Rammer. Full data on this low cost will be found in Bulletin 621. Write Barco Mfg. Co., 1801 Winnemac Ave., Chicago 40, Ill. or check the coupon.

How Reflective Sheeting Improves Traffic Signs

157. Get full data on Grotelite reflective sheeting for smooth, brilliant, long-life traffic signs and marking devices from the Grote Mfg. Co., Bellevue, Ky. Use the handy card or coupon today.

Excavating Machines Engineered for Performance

119. A complete line of excavating and materials handling machines in 10 to 60 ton—½ to 2½ cu. yd. capacities are offered by Osgood-General, Marion, Ohio. Several bulletins give details on special features that increase efficiency and reduce maintenance. Check the coupon for full information.

New Development in Volute Design

141. The Twin-Coaxial Volute, developed by Ralph B. Carter Co., Hackensack, N. J., is featured in a new bulletin on the "Humdinger" self-priming centrifugal pump. Complete range of sizes from 1½" to 10" with choice of drives and mountings is described. Get your copy now by checking the coupon.

Weed Killers For Every Purpose

180. Weed and brush control chemicals of both selective and non-selective types are described in a 4-page folder published by Brulin Co., Inc., Dept. 614, 2939 Columbia Ave., Indianapolis 7, Ind. Get this bulletin to learn the proper chemical and application method for your needs. Check the handy coupon.

Be Sure to Investigate This New Ditcher

165. New features of the Barber-Greene Model 705-B "Runabout" ditcher include fluid coupling for positive drive protection and special curved tooth bucket line in 5½", 7½" or 10½" digging widths. An attractive 8-page folder gives details on these features plus the hydraulic digging transmission and useful data on costs, digging speeds and ratios of pipe size to trench widths. Check the coupon or write Barber-Greene Co., Aurora, Ill.

Increase Your Grader Usefulness With an Elevating Attachment

187. Be sure to investigate the Barnard and Leas heavy-duty elevating grader attachment for casting, stripping, loading and terracing—wherever you have to dig in and move dirt. Colorful Bulletin 952-G shows all features of this cost-saving attachment for Galion graders. Check coupon for your copy. Barnard & Leas Mfg. Co., Inc., Cedar Rapids, Iowa.

Portable Hot Asphalt Paving Repair Unit

171. Maximum economy in paving maintenance and repair is claimed for the compact "Patchmobile" which has a rotary tube continuous dryer, batching hopper for accurate proportioning, twin hot asphalt tanks, heat jacketed pugmill, tool heaters and hand spray bar. Check all these features by getting form 210 from Wylie Mfg. Co., 416 S. W. 23rd, Oklahoma City, Okla. Use the coupon.

3-53

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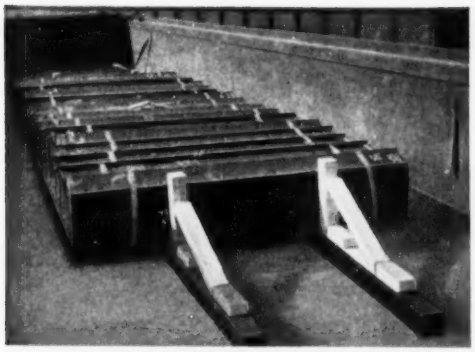

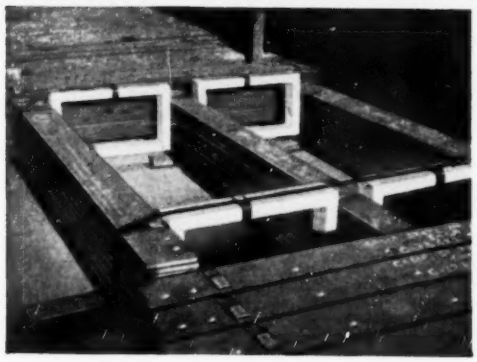

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Bitumuls Paving Handbook Full of Useful Data

23. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the coupon. American Bitumuls Co., 200 Bush St., San Francisco 4, Calif.

Painting Water Tanks For Longer Protection

52. High labor costs demand special consideration when painting elevated water tanks. This and other factors involved in proper paint selection are discussed in a bulletin issued by Jos. Dixon Crucible Co., Jersey City 3, N. J. Helpful specifications for repainting water tanks are also included. Check the coupon today.

Insurance Benefits For Civil Employees

73. Civilian government employees are offered insurance protection at the lowest possible cost by Government Employees Insurance Companies, Gov't Employees Insurance Bldg., Washington 5, D. C. Full details available by checking the coupon.

Helpful Data on Distributors For Bituminous Materials

79. Two models of pressure distributors featuring uniform pressure and temperature, accurate displacement pumping are covered in bulletins available from Standard Steel Works, Dept. PW, North Kansas City, Mo. Check coupon for copies.

Operations Manual Tells Brush and Weed Control Techniques

50. Data on methods and results in chemical brush and weed control are outlined in an operations manual compiled by the Du Pont Company. Included are cost data and evaluations of short-term vs. long-range control programs. Copies of this illustrated manual may be obtained from Grasselli Chemicals Dept., E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del., or by using coupon.

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WATER WORKS

Head Loss Data On Plastic Pipe

26. Carlon Products Corp., 10225 Meech Ave., Cleveland 5, Ohio, announces that authoritative data has been compiled on head loss due to friction in Carlon plastic pipe and is available in the form of graphs and charts. The graphs show superior flow characteristics, attributed to the fact that plastic pipe is not "wetted" by water. Send for this data today by using the handy coupon.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

96 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, colorimeters and similar devices. A 96 page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

The Modern, Streamlined Elevated Tank

32. An 8-page bulletin describes the Watersphere, a modern elevated water tank of welded steel construction for general service gravity water pressure and fire protection. Construction details, illustrations of typical installations and table of standard sizes from 25,000 to 250,000 gallons capacity are included. Check the coupon. Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

What You Should Know About Chemical Proportioning Pumps

38. In an attractive new bulletin you will find latest information on the Heavy-Duty Chem-O-Feeder, plus many installation diagrams, construction and operating details, list of chemicals fed and other helpful information on constant rate and flow proportional chemical feeding. Get your copy from Proportioneers, Inc., Providence 1, R. I., by checking the coupon.

Turbidity Color and Hardness Removal

56. Modern water pre-treatment with Dorr equipment and methods is described in Bulletin No. 9141, which gives basic design data and flowsheets for pre-treating highly turbid water, color removal or treatment of low turbidity, and softening. Typical analyses for various types of waters are given together with detention times in recommended treatment units. Write The Dorr Co., Dept. PW, Barry Pl., Stamford, Conn.

Specifications for Jointing Reinforced Concrete Pipe

63. Engineering specifications for use of Hexseal rubber gaskets with reinforced concrete sewer pipe are contained in a new brochure published by Universal Concrete Pipe Co., Dept. PW, 297 S. High St., Columbus, Ohio. Subjects include dimensions, pipe design reinforcement, curing and jointing instructions. Get your copy by checking the coupon.

Pipe Detector Determines Exact Location and Depth

120. Determination of the exact location and depth of buried pipes, valves, service cables and other metallic objects can save costly digging and unnecessary damage. Your work can be speeded when you use the Detectron pipe detector, which features simple operation, shielding to avoid static interference, economical unit construction and a lifetime guarantee. Get full data from Detectron Co., 5631 Cahuenga Blvd., No. Hollywood, Calif., by using the coupon.

To order these helpful booklets check the coupon on page 32.

Technical Data on Fluorides And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

Handbook of Cast Iron Pipes and Fittings

66. "Pipe Economy", the handbook of Clow-National Pipe products and fittings for water, gas and sewers has become a standard reference in the library of engineers and designers everywhere. You can obtain a copy of the latest edition by checking the coupon. Issued by James B. Clow & Sons, 201 N. Talman Ave., Chicago 80, Ill.

Floatless Liquid Level Controls

92. Complete descriptions of electrode type floatless liquid level control systems, including control units, electrodes and fittings, panel assemblies and diagrams of typical installations for all types of municipal service are covered in the 32-page catalog of Charles F. Warrick Co., 1956 W. Eleven Mile Rd., Berkley, Mich. Check coupon for your copy.

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Makes Underground Pipe Installations Easy

115. One-man operated hydraulic pipe pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213, Greenlee Tool Co., Rockford, Ill. Just check the coupon.

Reference Catalog for Valves, Fittings and Hydrants

72. A complete line of gate valves for all services, standard flanged and screwed fittings, and the Kennedy "Safetop" fire hydrants are fully described in Catalog 63 of The Kennedy Valve Mfg. Co., Elmira, N. Y. All engineers who specify valves, fittings and hydrants should have this valuable catalog for ready reference. Check the coupon.

To Restore Capacity Of Water Lines

78. Water pipe cleaning service by hydraulic methods, power driven cleaners for scale and encrustation removal, plus relining of water mains are services offered by Ace Pipe Cleaning Contractors, Inc., 2003 Indiana Ave., Kansas City, Mo. For full description of these and other pipe cleaning services get the illustrated Ace catalog. Just check the coupon.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2¼" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

How Your Filter Washing Can Be Improved

136. More thorough sand washing with the elimination of mud balls and cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by the Palmer Filter Equipment Co., P. O. Box 1655, Erie, Pa.

Helpful Data on Mechanical Joints

138. Get Circular 49 from M & H Valve & Fittings Co. for important information and installation dimensions of M & H AWWA Mechanical Joint Valves and Hydrants. Features include ease of installation, construction economy, long life. Use coupon or write M & H Valve & Fittings Co., Anniston, Ala.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 277, Columbus 9, Ohio. Water quality, construction methods, costs, performance and other topics are considered Check the coupon to get your copy.

Reconditioning Pipe Lines With Cement-Mortar Linings

80. Pipe lines from 4 to 144 inches in diameter can be cement lined in place by the Centriline and Tate Processes. Catalog 9-52-5M describes how this operation gives new pipe line perfomance for a fraction of the cost of new pipe and shows how the work is done. Check coupon for your copy. Centriline Corporation, 140 Cedar St., New York 6, N. Y.

Engineering Data on Diatomite Filters

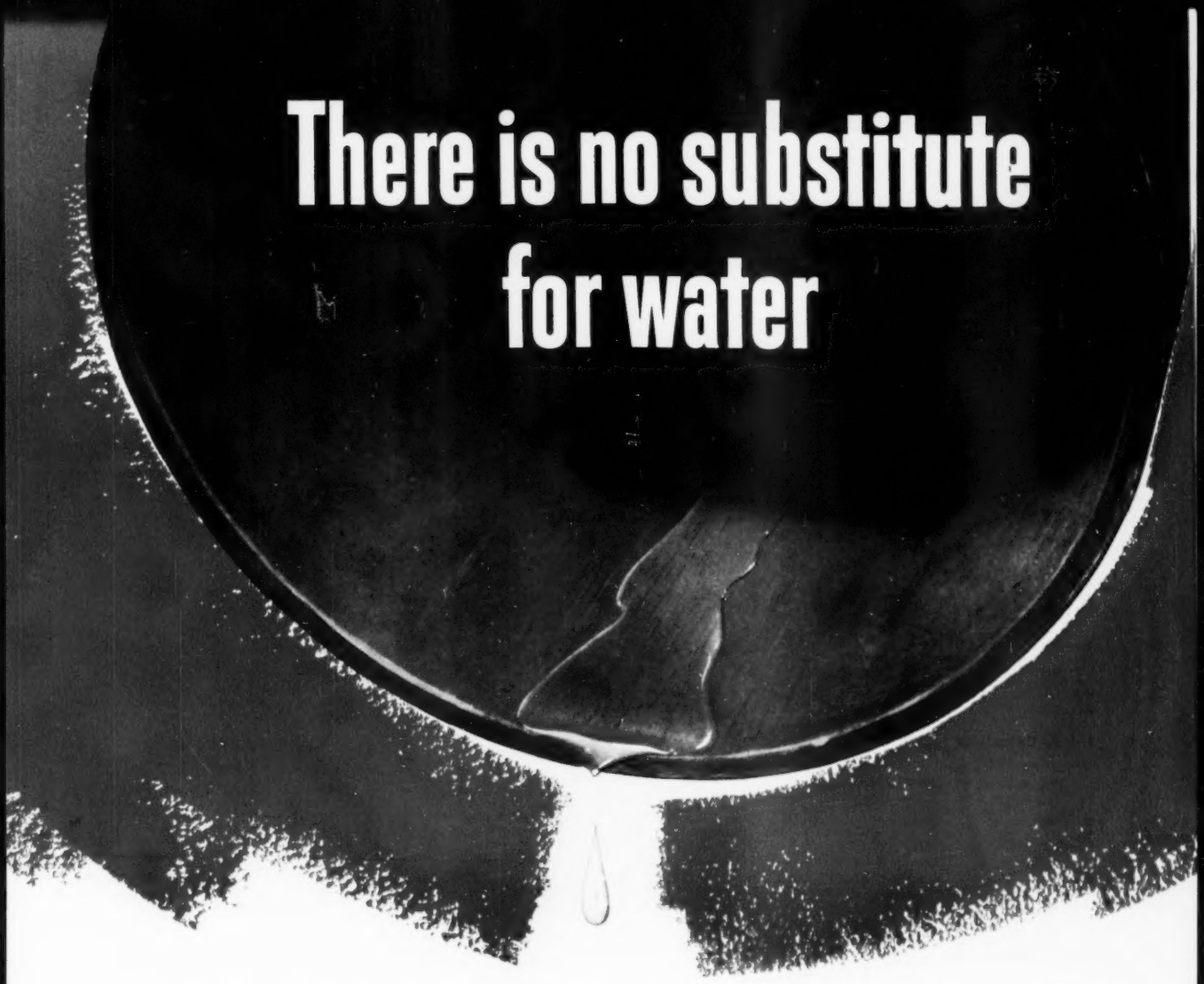
139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the coupon for full information including table of filter sizes and capacities, space required and filter operation.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Helpful Book Gives Pipe Flow

159. This handy 40-page pocket size book titled "Measurement of Water Flow Through Pipe Orifice with Free Discharge" explains the Layne pipe orifice meter method of computing water flow. Includes flow graphs for various size pipes. Layne & Bowler, Inc., Box 215, Hollywood Station, Memphis 8, Tenn.



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WATER WELLS

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What You Should Know About Fluoridation and Fluoridators

155. Two helpful publications issued by Wallace & Tiernan titled "Fluoridation" and "Fluoridators" show the development of fluoridation, list the chemicals and dosage normally used, and give full techincal data on solution feed and dry feed fluoridators. Be sure to get these publications from Wallace & Tiernan by checking the coupon today.

Inserting Valves Without Shutdown

162. Do you have the latest data on equipment for inserting control valves where shutdown is impractical? Mueller catalogs H-20 and H-602 give all details on inserting valves and equipment, using hand-operated or power-operated machines. Get these catalogs today by checking the coupon. Mueller Co., Decatur, Ill.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Handy Calculator for Cast Iron Pipe

175. With the handy Cast Iron Pipe Calculator you can determine at a glance the class, weight and dimensions of bell and spigot pipe. This slide-rule type calculator is absolutely free. Use coupon or write R. D. Wood Company, Public Ledger Bldg., Philadelphia 5, Pa.

What You Should Know About Design of Gravity Filters

190. Complete design data on gravity filters and details of all filter accessories will be found in a comprehensive 24-page booklet prepared by the Permutit Co., 330 West 42nd St., New York 36, N. Y. Every engineer dealing with water problems should have a copy of this authoritative reference. Check the coupon for yours.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., 208 So. La Salle St., Chicago 3, Ill.

Helpful Valve Catalog For Engineers

236. For complete descriptions of Darling double disc, parallel seat gate valves be sure to get Bulletin 5002 issued by Darling Valve & Mfg. Co., Williamsport, Pa. Construction details covering all valve parts and accessories are helpful for specification writers. Check the coupon for your copy.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. Get full details by checking the coupon. Trojan Mfg. Co., 114 Race St., Troy, Ohio.

Data on Mixers For Flocculation Tanks

265. Full data on Link-Belt Straightline mixers for flocculation tanks will be found in Folder No. 2042, issued by Link-Belt Co., Box 472, Lansdale, Pa. Layouts of typical tank arrangements are included. For your copy just check the coupon.

General Catalog on Measuring and Controlling Equipment

272. The full line of Simplex equipment for the measurement and control of liquids and gases in water and sewage plant installations is illustrated and described in detail in 28-page Catalog 003. Every engineer should study the design data in this helpful booklet. Write Simplex Valve & Meter Co., 68th & Uplands Sts., Philadelphia 42, Pa., or use the coupon.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Burlington, N. J. Get your copy by checking the coupon.

Corrosion Protection For Water Works

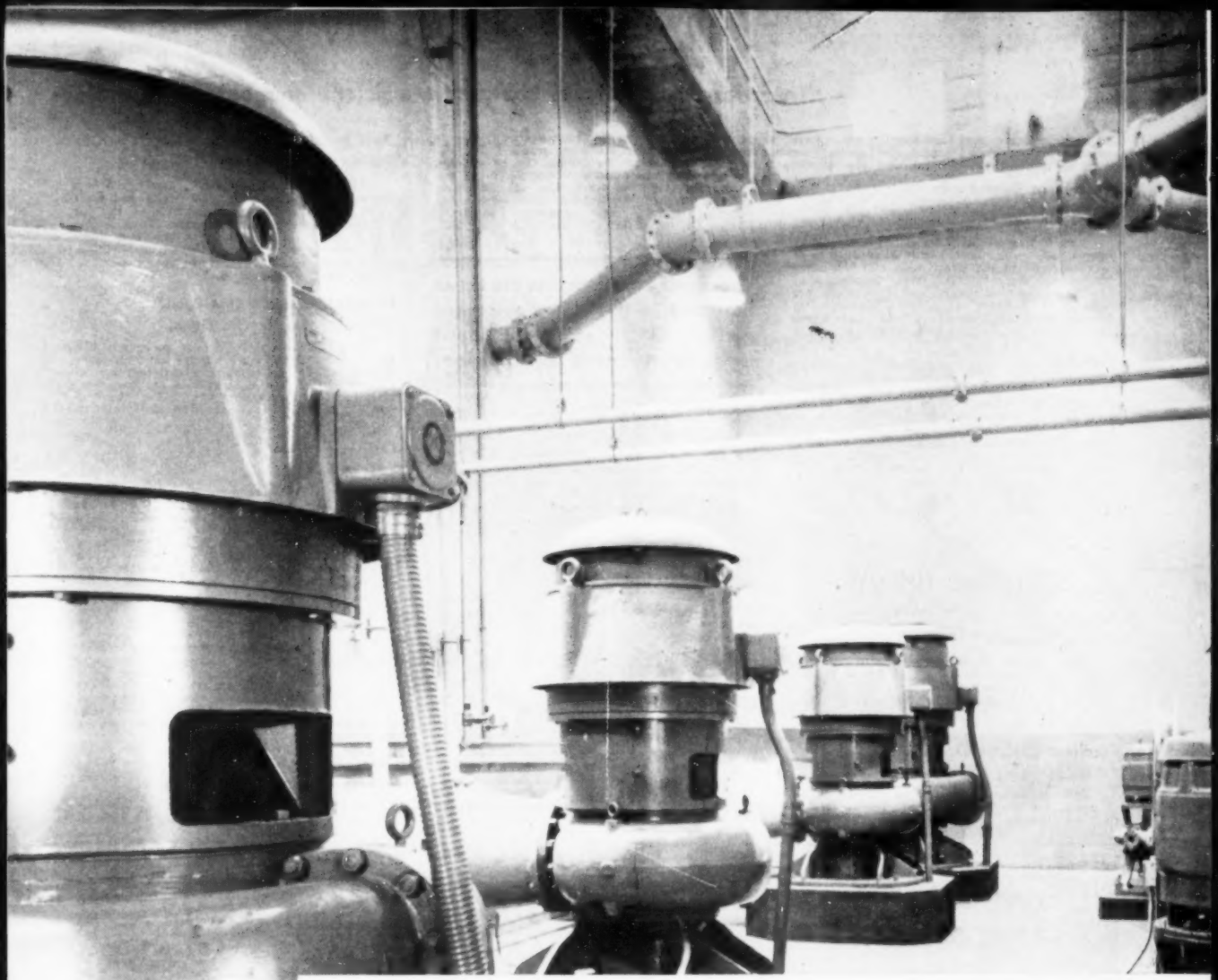
280. Steel pipe lines, elevated tanks, treatment plant equipment and all other steel structures subject to rust, tuberculation and attack by aggressive soils can be protected by long-lasting Bitumastic enamels. Send for bulletins today so that you can specify the right coating for your job. Use coupon or write Koppers Co., Tar Products Div., Pittsburgh 19, Pa.

Handy Catalog Covers All Pipe Repairs

290. A complete catalog covering repair clamps, packings and gaskets of several designs to suit all needs is offered by Smith-Blair, Inc., So. San Francisco, Calif. Directions for use show ease of application. Every water works needs a copy of this catalog for ready reference. Available by using the coupon.

What You Should Know About Turbine Pumps

294. In a colorful bulletin titled "Water, Where You Want It . . . When You Want It" the Johnston Pump Co., 3272 Foothill Blvd., Pasadena 8, Calif., gives details on turbine pumps with both semi-open and closed impellers;



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. . . that when you want to move big volumes of sewage or storm water *economically,* your best bet is Fairbanks-Morse *Angle*flow Pumps. Designed for maximum plant efficiencies where large quantities must be pumped against moderate heads, these dependable pumps give you a new high in service . . . a new low in operating and maintenance costs. Wide, unobstructed passages through impeller and volute make them especially suitable for handling debris-filled water. Sizes range from 8 to 54 inches . . . capacities up to 80,000 g.p.m. For complete information see your local Fairbanks-Morse Branch or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

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oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1013 by checking the coupon.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check coupon for your copy.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, manueverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the coupon.

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STREETS AND HIGHWAYS

What's Your Traffic Problem?

127. Traffic signals and controllers of every type are offered by Eagle Signal Corp., Moline, Ill. You will find a great deal of helpful data and diagrams of typical installations in Bulletins A 10 and C 10, available by checking the coupon.

Excellent Booklet Shows Aerial Mapping Technique

235. A clear explanation of the technique of aerial topographic map production is given in "Air Speeds Your Map Needs." Striking photographs trace aerial photos step-by-step to the final maps for highway location, city and regional zoning and planning, traffic studies, drainage and watershed projects, tax maps and many other types of work. Use the coupon to get this excellent booklet for public works and planning officials. Jack Ammann, Photogrammetric Engineers, 829 N. St. Mary's St., San Antonio 2, Texas.

Over one hundred items are listed here and in the New Equipment section. Order what you need today. Just check the coupon.

What You Should Know About Chemical Weed Control

132. In a convenient 44-page book, the C. B. Dolge Co. gives full details on spraying procedures and chemicals to use for control of lawn and roadside weeds, ragweed eradication and insect control in turf. Get your copy by checking the coupon or write C. B. Dolge Co., Westport, Conn.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio.

Black-Top Paver Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Fast Mowing in Hard-to-Reach Places

163. The lightweight, power driven Scythette mows smoothly near walls and trees or in rocky, hard-to-reach places; does the job 4 times faster than hand methods. Interchangeable chain saw unit, the Sawette, cuts trees and other growth up to 6" diameter. Check the coupon for illustrated folder offered by Hoffco, Inc., Richmond, Ind.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic signs faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Use the coupon for data today. Grace Sign & Mfg. Co., St. Louis 18, Mo.

Latest Data on Rubber Roads

296. A report covering all developments to date on the use of natural rubber in road surfacing of asphalt highways has been issued by the Natural Rubber Bureau, 1631 K St., N. W., Washington 6, D. C. Get your copy of this 52-page booklet which includes new data on research and full reports on test roads in many states. Use the handy coupon.

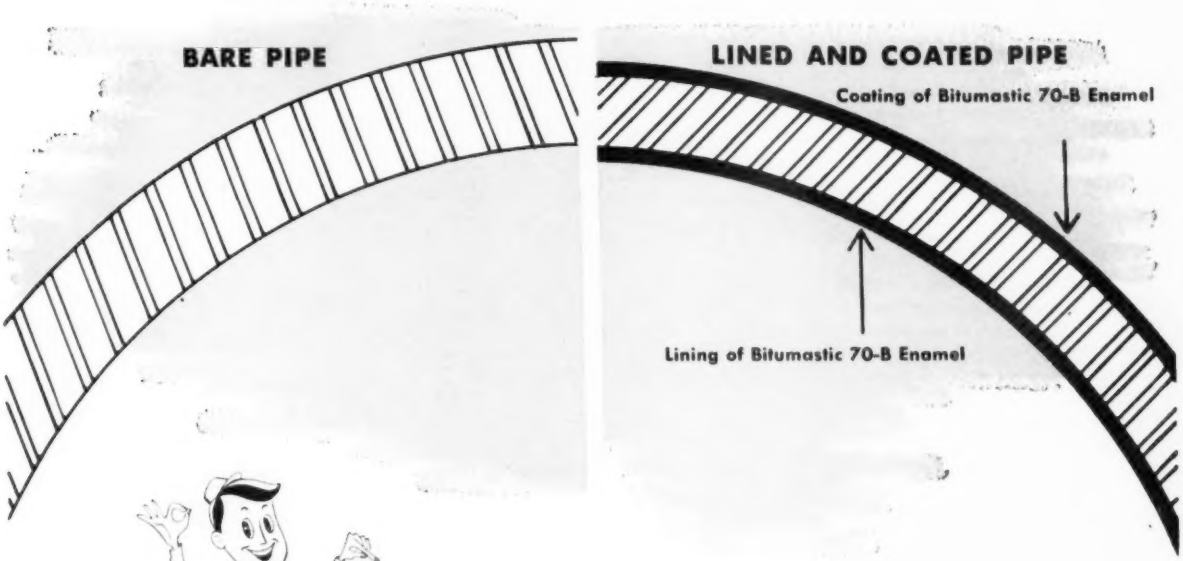
Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Lafayette, Ind. or use the coupon.

Concrete Saw Cuts Smooth, Straight Edges

65. When the sides of patches and trenches are sawed before breaking, a saving of 25% in

Yes—you can specify steel pipe —with less wall thickness



. . . when you protect it with BITUMASTIC® 70-B ENAMEL

BITUMASTIC 70-B Enamel—when applied to a thickness of 3/32"—protects the exterior of pipe from the corrosive action of the soil in which it is buried. It is much more economical to use this protective coating than to specify pipe with greater wall thickness in order to allow for future corrosion.

For instance, if it were calculated that a 3/4" wall would provide sufficient structural strength for a given pipe line, it would be unnecessary to specify a 5/8" wall to compensate for corrosion. The use of Bitumastic 70-B Enamel would do away with the need for the additional 1/4" of steel—a substantial saving.

Besides specifying less wall thickness, you can use *smaller* pipe by applying Bitumastic 70-B Enamel. A spun lining of this enamel *keeps* flow capacity high. So you don't have to buy *over-sized* pipe to allow for future "shrinkage."

Give your community this two-way savings on your large-diameter water lines by specifying strong, durable steel pipe, lined and coated with Bitumastic 70-B Enamel. If you wish, we will handle the entire coating job for you. Write for full information.

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removal costs is claimed. And the smooth, straight edges won't spall or crack after replacement material is poured. Investigate the exclusive features that give maximum economy to Clipper concrete saws. Full information from Clipper Mfg. Co., 2823 S. Warwick, Kansas City 8, Mo., or check the handy coupon.

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CONSTRUCTION EQUIPMENT AND MATERIALS

What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 10 feet behind tractor in 140° arc and to depth of 8 feet. For full details check the coupon. Sherman Products, Inc., Royal Oak, Mich.

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

Catalog Covers Complete Line of Adams Road Machinery

45. All machinery in the Adams line of road building and maintenance equipment is illustrated and described in an attractive catalog, Form 5110, issued by the J. D. Adams Mfg. Co., Indianapolis, Ind. Included are motor graders, self-propelled Traveloader, pull type graders and accessories. Check coupon for your copy of this comprehensive booklet.

Handbook of Contractors Pumps Is Easy to Use

49. Big 50-page Catalog P-10 covers dewatering pumps, pressure pumps, well point systems and electric pumps, and also features a special section of useful data which helps in the selection of the right pump for your job. Every construction engineer and contractor should have a copy of this valuable handbook. Just check the coupon. The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

Blades For All Types Of Equipment

60. Get information now on long-wearing blades for graders, scrapers, bulldozers, snow plows and scoops; snow plow noses and runners; scarifier teeth and numerous other products for road machinery. Check coupon or write to Paper-Calmenson & Co., St Paul 8, Minn.

Booklet Helps Design of Custom-Engineered Steel Buildings

110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

Gunite Costs Less On Repair Jobs

255. Be sure to investigate Gunite for repair of reservoirs, dams, water and sewage plant tanks, sewers, swimming pools, etc. Contact Eastern Gunite Co., Elkins Park, Pa. for full information, or use coupon.

Choosing Trucks For Municipal Service

264 For all municipal services, trucks are needed that are high in efficiency and economy. Be sure to investigate the White 3000, engineered for high performance. Full details on White Super Power trucks from the White Motor Company, Cleveland 1, Ohio.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2125 Riverdale Ave., Port Chester, N. Y.

Three-Wheel Roller For General Purpose Duty

142. A 20-page bulletin describing general purpose 3-wheel rollers covers 8, 10, 12 and 14-ton gasoline and diesel models of the Huber line. Illustrations and comprehensive explanation show component parts of the rollers and describe the general duties of the units. For your copy of this attractive bulletin, No. H-150, write the Huber Mfg. Co., Marion, Ohio, or use the coupon.

Manual on Retaining Wall Design

160. Embankment stabilization with Armco Bin-Type Retaining Walls is discussed in a 16-page illustrated booklet offered by Armco Drainage and Metal Products, Inc., Middletown, Ohio. Included are case histories which show embankments along highways, lakes, streams and city streets. Technical data covers selection of design and units required for various sections, curves and grades. Use the handy coupon.

How Air Placement of Concrete Will Help on Your Jobs

215. There are hundreds of jobs that can be done easier and cheaper by air placement of concrete; reservoir, tank and pool linings, concrete maintenance of all sorts are just a few of the applications. Get full details on two models of the high speed, easily operated "Bond actor" from Air Placement Equipment Co. 1009 West 24th St., Kansas City 8, Mo. Check the coupon.

Get Tough Blades and Cutting Edges For Your Construction Equipment

221. Controlled analysis steels used in Shunk blades and cutting edges for graders,

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When you buy a Homelite pump, generator, blower, or chain saw, you buy a superior product. You get outstanding performance and real dependability, the results of Homelite's 30 years' experience in manufacturing gasoline engine driven units. And with this, you get a plus . . . a big plus...*service* of unusual caliber.

Covering the entire country, there are 45 Homelite factory branches . . . fully staffed by Homelite men and completely stocked with Homelite parts. These factory branches are Homelite branches *exclusively* . . . servicing Homelite products exclusively . . . serving Homelite customers exclusively. They are established, located and equipped to bring factory precision service to you *in the field* . . . in the fastest possible way.

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Buffalo, New York – Fillmore 1515
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Detroit, Michigan – Tyler 7-1811
Fresno, California – Fresno 4-5170
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Grand Rapids, Mich. – Glendale 2-9204
Harrisburg, Penna. – Harrisburg 5-6711
Houston, Texas – Preston 7371
Indianapolis, Indiana – Irvington 6447
Jackson, Mississippi – Jackson 3-8483
Jacksonville, Fla. – Jacksonville 3-5475
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scrapers, dozers, and snow plows mean long life and wear resistance to give you more value for your maintenance dollar. Full data for ordering blades and scarifier teeth for standard and special equipment is available from Shunk Mfg. Co., Bucyrus, Ohio. Check the coupon today.

Be Sure To Investigate Truck Shovels

286. A complete and factual booklet issued by "Quick-Way" Truck Shovel Co., Denver, Colo., gives all the details on four truck shovel models. Profuse illustrations and descriptive copy show the reader how these adaptable machines do the work quicker and easier. Check the coupon for your free copy.

Details on Motor Grader Construction and Use

312. In a handsome catalog, profusely illustrated with diagrams and photographs of unusually fine quality, the Galion Iron Works and Mfg. Co., Galion, Ohio, has presented all details on the construction and operating features of their Model 118 motor grader. This impressive 28-page catalog, No. 375, is available without charge. Just check the coupon.

●

REFUSE COLLECTION AND DISPOSAL

Sanitary Landfill Operation and Methods

28. The location and area requirements for sanitary landfill, operation methods for trench type and area fills, equipment selection and costs are items discussed in an 8-page booklet issued by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Be sure you have this reference when considering the problem of garbage and refuse disposal. Check the handy coupon today.

What You Should Know About Refuse Incinerators

58. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the coupon.

How to Reduce Refuse Collection Costs

123. The sequence of operations for fast loading and refuse compaction in the Gar Wood Load-Packer are illustrated and described in 12-page folder W-110, together with size data and details of hydraulic elements. Be sure to check all details of the efficient Load-Packer system. Check coupon or write Gar Wood Industries, Wayne Division, Wayne, Mich.

Efficient Material Handling to Reduce Incineration Costs

130. Blaw-Knox Buckets specially designed for refuse and garbage handling are described in 22-page Bulletin 2350. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa

How to Build A Sanitary Land Fill

260. Proper use of equipment and the four steps necessary to build a good sanitary fill are shown in an illustrated folder prepared by Drott Mfg. Corp., Milwaukee 12, Wisc. Check coupon today for your copy.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

●

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

Odorless Sanitary Septic Tank Cleaning

88. The Gorman-Rupp Odorless Sanitary Cleaning unit combines centrifugal self-priming pump, air-cooled engine and oval tank on a sturdy frame. For full description of this adaptable unit get bulletin 7-ST-11. Gorman-Rupp Co., 120 N. Bowman Ave., Mansfield, Ohio.

Design Data for Insulated Piping

188. For all jobs where insulated piping is required you will want full design data on Ric-wiL Prefabricated Insulated Piping. Get 28-page catalog from the Ric-wiL Co., Cleveland, Ohio, for details on both underground and overhead lines.

Complete Data On Sludge Pumps

193. Sludge pumps, simplex, duplex, triplex and quadruplex, normal and heavy duty models, are described in Bulletin S48 issued by Marlow Pumps, Ridgewood, N. J. Check the handy coupon for your free copy.

How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

A Handbook of Sewer Cleaning Equipment and Methods

46. A fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new SewerRodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

Engineering Facts About Transite Pipe

83. This compilation of Johns-Manville's "Engineering Facts" series presents concise, factual information about Transite's many economic and engineering advantages, and includes informative case histories plus dimensions and data for your files. Write Johns-Manville, Box 290, New York 16, N. Y., or use the handy coupon.

Using Sewage Sludge Gas For Power Generation

90. Fairbanks-Morse dual fuel engines can operate on either sludge gas or oil to provide steady power output despite fluctuations in gas supply. Bulletins are available on several sizes to meet your needs. Write, giving exact requirements to Fairbanks, Morse & Co., Dept. PW, 600 So. Michigan Ave., Chicago 5, Ill. or use handy coupon.

Forms for Every Concrete Pipe Shape

95. In addition to this a complete line of forms for standard concrete sewer and drainage pipe, special forms for varied shapes of every type are listed in the Quinn Concrete Forms Catalog. Copies available by checking the coupon, or write direct to Quinn Wire and Iron Works, 1621 12th St., Boone, Iowa.

End Root Problems With Root-Proof Sewers

107. Troubles caused by roots and corrosions in house connections can be eliminated by the use of root-proof Bermico sewer pipe. Full details on this smooth, waterproof, tight-sealing pipe available by checking the coupon, or write to the Brown Co., Dept. PW, 150 Causeway St., Boston 14, Mass.

What You Should Know About Design and Use of Concrete Sewers

122. Every engineer and contractor should have a copy of the 48-page book "Concrete Sewers" in his library. This valuable text, published by the Portland Cement Assn., 33 W. Grand Ave., Chicago 33, Ill., gives an authoritative discussion of hydraulics, sewer design, construction and maintenance. Generous use of helpful illustrations makes the book attractive and helpful to the reader. For your copy, just check the handy coupon.

Design Data for the Spiraflo Clarifier

124. Be sure to investigate the advantages of the Spiraflo clarifier for sewage treatment. Full engineering data, description of the unit, test results and specifications are offered in 24-page Bulletin 122 by Lakeside Engineering Corp., 222 W. Adams St., Chicago, Ill. Check the coupon today.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves is contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., 200 Eliot Street, Fairfield, Conn.

Comminutors for Automatic Disposal of Coarse Sewage Solids

152. The problems connected with disposal of coarse sewage solids are eliminated by clean, odorless, automatic Comminutors. Full engineering data show the proper model for every size plant and furnish details of hydraulics and typical installations. Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill.

Helpful Data on Sluice Gates

158. In a well-organized 48-page catalog you will find complete engineering and design data on Pekrul sluice gates, headgates, automatic flap gates, lifts and accessories. Numerous models in 6" to 92" sizes are available, and all pertinent data will be found in this helpful booklet. Write Morse Bros. Machinery Co., Denver, Colo., or use the coupon.

How Vacuum Filters Help Your Sewage Sludge Disposal

209. Applications of the Conkey sludge filter to all types of sewage sludge are described in Bulletin 100. Tables show filter sizes, weights, and give anticipated average results. Use the coupon to order your copy. General American Transportation Corp., Process Equip. Div., New York 17, N. Y.

How to Compute Quantities of Jointing Materials

271. A helpful table for determining quantities of "Tegul-Mineralead" required, using jute or "Hyde-Ro Rings", plus complete answers to your questions on sulfur compound jointing materials will be found in Bulletin M-10 issued by Atlas Mineral Products Co., Mertztown, Pa. Check the handy coupon today.

Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Corp., Harrison, N. J.

Porous Media Handbook For Sanitary Engineers

222. A really helpful 56-page booklet just published by the Carborundum Company tells the complete story of the use of porous media in the fields of water and sewage treatment. The major portions are devoted to water filtration and air diffusion for activated sludge treatment. Diagrams show the many installation methods used, and full data is provided for the designing engineer. General data and specification sections complete this valuable reference bulletin. Get Form 5118 by checking coupon or write The Carborundum Co., Refractories Div., Perth Amboy, N. J.

The Manufacturers' literature described on these pages is costly, so order just what you need. Use the handy mailing card or coupon today.

Efficient Blowers for Activated Sludge Plants

232. Many advantages of Roots-Connersville positive displacement rotary blowers are described in Bulletin 22-23-B-13, which also provides characteristic curves for operation with constant speed, multi-speed and variable speed motors and details of several types of blowers. Get this helpful bulletin by checking the coupon. Roots-Connersville Blower Corp., Connersville, Ind.

Heating, Thawing and Melting With Hauck Burner Equipment

277. A helpful 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. For a useful addition to your reference file, get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

Reference Book on Lubricated Plug Valves

273. Lubricated plug valves, including stick-proof lever sealed valves for easy operation and positive mechanical seal are fully described in reference books issued by Homestead Valve Mfg. Co., Box 550, Coraopolis, Pa. Check the coupon for your copy.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering-Superheater Inc., Flash Dryer Div., 200 Madison Ave., New York 16, N. Y.

Cleaning Service for Every Type of Pipe Line

302. Flexible Pipe Cleaning Co., operating with specialized equipment and trained crews, is prepared to remove scale, rust and other deposits from pipes for every type of service. For details and estimates furnished without obligation write Flexible Pipe Cleaning Co., Box 167, Los Nietos, Calif. or check the coupon.

Discussion of Sewage Chlorination

316. Sewage chlorination and factors in selecting chlorine gas feeders are discussed in Keep Sheet No. 15 issued by Builders-Providence, Inc., 356 Harris Ave., Providence 1, R. I. All factors related to sewage chlorination are covered in this valuable reference leaflet. Check the coupon for your copy.

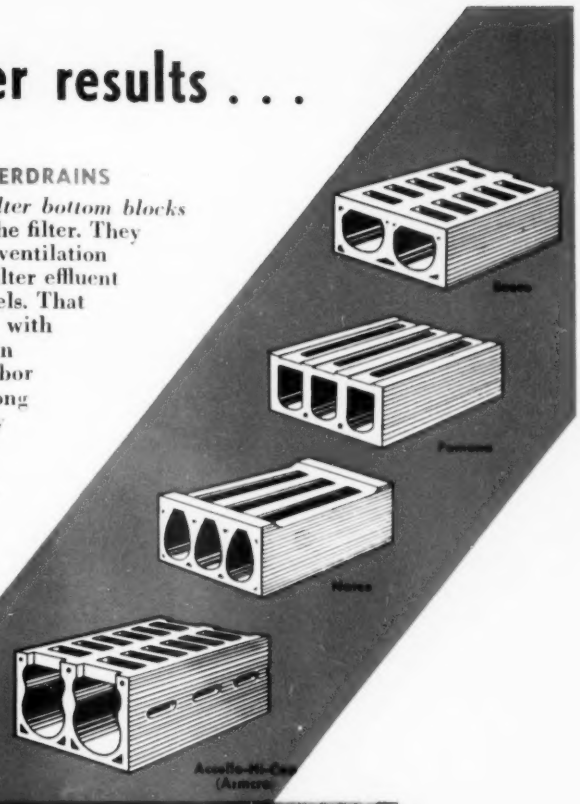
For better trickling filter results . . .

USE TFF INSTITUTE SPECIFICATION UNDERDRAINS

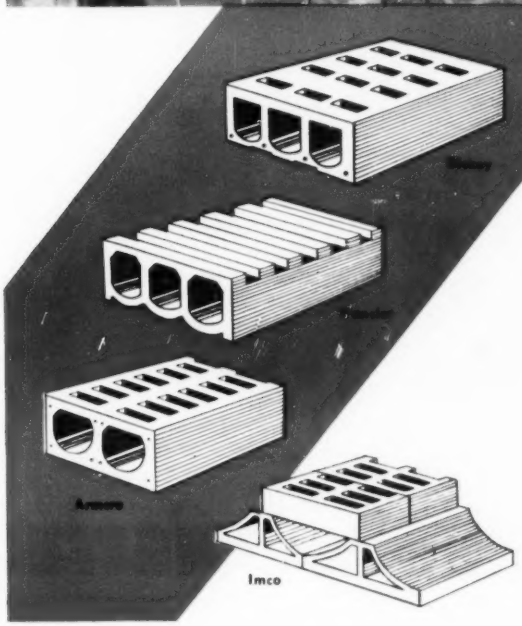
The scientific design of these *vitrified clay filter bottom blocks* insures trouble-free operation for the life of the filter. They have large top openings. That means proper ventilation of all filter media and free discharge of the filter effluent at all times. They have smooth run-off channels. That means quick drainage and no clogging even with years of operation. The blocks are light in weight, self-aligning and easy for unskilled labor to lay. After they have been laid they are strong enough to work on and to support even very deep filter media.

These modern underdrain blocks will carry applications up to 50 MGAD. They are best for all kinds and shapes of filters. They are used everywhere better operating results are desired.

Use them to insure best results from your next trickling filter. Give it a *specification* floor. Use TFFI *vitrified clay filter bottom blocks*. For full engineering details write any member of this Institute today.



Monticello, N. Y. Trickling Filter under construction. Olney Borden, third from left, Consulting Engineer.



Here's the Payoff . . .

Monticello, N. Y.: Completed in 1951, the first full year of operation has been completed. Designed for a flow of 2 mgd, the flow on 17 July, 1952, was 1.2 mgd. Raw sewage BOD was 210; final effluent BOD was 18 ppm. This plant used TFFI SPECIFICATION underdrains. Distributors are American Well Works; primary and secondary settling tank equipment is by Dorr.

TRICKLING FILTER FLOOR INSTITUTE

Bowerston Shale Co., Bowerston, Ohio
Industrial Materials Co., Philadelphia 34, Pa.
Texas Vitrified Pipe Co., Mineral Wells, Tex.
Natco Corporation, Pittsburgh 22, Pa.
Pomona Terra-Cotta Co., Pomona, N. C.
W. S. Dickey Clay Mfg. Co., Kansas City 6, Mo.
Ayer-McCarel-Regan Clay Co., Brazil, Ind.

TRANSITE PIPE last longer California city streets?

Transite Pipe was first installed by this California city nearly 20 years ago. Its lasting strength and high corrosion resistance have enabled it to outlast pipe previously used several times over.

Research designed it for lasting strength

TODAY, ACROSS THE COUNTRY—under countless city streets like the one shown above—Transite® Pressure Pipe is doing a highly efficient job of transporting water . . . often under conditions so adverse to ordinary pipe that engineers marvel at Transite's ability to stand up through the years!

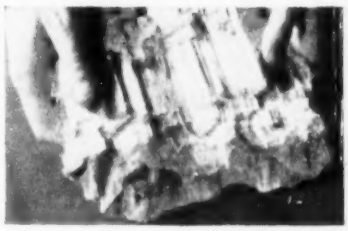
The reason? *Lasting strength!*

Not only does Transite Pipe have the *initial* strength that's needed in a pipe intended for use under busy city streets. Equally important, it has the *lasting* strength that enables it to survive continued corrosive attack, year after year . . . to keep on giving the same dependable, economical service to the community as the day it was installed.

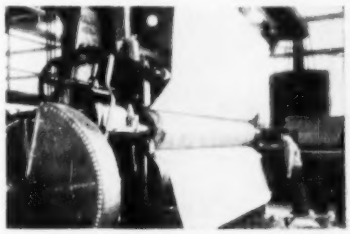
This highly important quality of lasting strength is one of many notable inherent advantages of a pipe engineered with modern water transportation requirements in mind. Transite's Simplex Couplings reduce leakage losses to a minimum, provide flexibility to help relieve the line of soil stresses and traffic loads. Its light weight makes for easier handling and effects substantial savings during installation. Its smooth interior assures a high coefficient of flow (C=140) and, because Transite can never tuberculate, helps keep pumping costs low through the years.

Why not get all the details . . . find out how this modern-engineered-for-the-job asbestos-cement pipe can help solve your water-line problems and *save you money?* For full information, write Johns-Manville, Box 60, New York 16, N. Y.

JM PRODUCTS



Tough, strong asbestos fibers reinforce Transite Pipe—contribute to its high corrosion resistance and lasting strength.

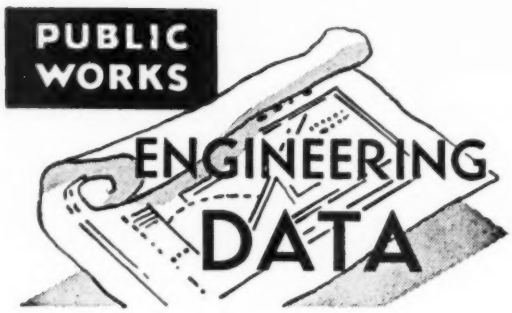


On machines like this, the asbestos-cement-silica mixture is "built up" under heavy pressure into a dense, homogeneous pipe structure.

Transite's flexible Simplex Couplings help relieve the line of excessive flexural stresses—an added safeguard against pipe failures.

asbestos-cement PRESSURE PIPE

Get full details of this month's new products . . . mail your Readers' Service card today.



Detecting Gas in Sewers and Manholes

A Sewer Survey and Gas Detection Unit was organized in San Francisco to investigate the physical and gaseous condition of the sewerage system. This unit consisted of a panel truck equipped with detection equipment operated by an engineering chemist, one sewer-cleaner and one laborer. Because of the lack of funds the unit became inoperative in March 1952 but within the four-month period in which it operated 2977 manholes were tested. Of these, 19 manholes showed definite explosive properties, having a content of over 60% of an explosive gas and air mixture. The Pacific Gas and Electric Company was notified when these conditions were detected, so that they could determine whether their gas lines were leaking. Tests were made at each manhole for the presence of explosive gases, hydrogen sulphide, carbon monoxide and for a deficiency of oxygen. It is the present plan to continue the survey until the entire sewer system is thoroughly investigated and the proper rechecks are made.

Cost of Pumping Water from Deep Wells

Unit costs of pumping water from deep well plants were reported in the 1951-52 report of the Pasadena, Calif., Water Department, of which Morris S. Jones is Chief Engineer and General Manager. A total of 262,833,900 cu. ft. of water was pumped against an average head of 365 ft. at a total cost of 4.22 cents per 1,000 cubic ft. per 100-ft. head. Booster plants pumped a total of 504,771,175 cu. ft. against an average head of 188 ft. at an average cost of 5.17 cents per 1000 cu. ft. per 100-ft. head. Unit power costs were not stated.

Bid Prices on Sewage Treatment Plant Additions

On the construction of additions to the Buffalo, New York, Bird Island sewage treatment plant, unit bids of the low bidder, W. F. Hendrich Co., Inc., were: $1.13 per yard for 53,000 cu. yds. of dry earth excavation; $6.00 per cu. yd. on 9,000 yds. of wet earth excavation; $50.00 per yd. for an estimated 50 cu. yds. of rock excavation. Concrete quantities in cu. yds. and bid prices per cu. yd. were: Class A-1, 1250 yds., $50; A-2, 900 yds., $30; B, 300 yds., $30. Rubbed finish for 19,200 sq. ft., 19 cents per ft. Reinforcing bars, 10 cents per pound. Sheet copper expansion joints, 550 lin. ft., $4.88 per ft.; ¾-inch mastic expansion joints, 2500 sq. ft., 48 cents. Poured asphalt joints, 1000 gals., $1.30 per gal. Miscellaneous common brick masonry, 50 cu. yds., $92 per yd.

Valve kinds, quantities and bid prices were: 4-inch gate, 5, $47.75 each; 6-inch gate, 4, $72.77 each; 6-inch check, 8, $76.18 each; 8-inch check, 6, $155.77 each;

3 Packages of chemical feeding proficiency

%Proportioneers% **Heavy Duty Chem-O-Feeder** is built in three basic models, having one, two, or three feeding heads, each of which is adjustable independently. These easy-to-install, easy-to-operate chemical proportioning pumps are specially engineered to simplify water treating work and to provide the utmost in dependability under all operating conditions.

Whatever your water treating problem, %Proportioneers% equipment and engineering knowledge are ready to help. The %Proportioneers% line includes the widest range of chemical feeding and water treating equipment: manually adjustable, constant-rate feeders; Pur-O-Cel Diatomite Filters; flow-proportional, automatic feeders. Consult your telephone directory for our nearest representative or **write direct for new Bulletin 1225-1.**

HEAVY DUTY CHEM-O-FEEDER SPECIFICATIONS:

- **Feeding rates 0.2 to 57 gallons per hour.**
- **Discharge pressures to 100 lbs. per square inch.**
- **Suction lifts up to 20 ft.**
- **Diaphragm type measuring chamber with molded reinforced "looped" diaphragm.**
- **Famous "See-Thru" molded plastic measuring chamber suitable for feeding most treating chemicals.**
- **Roller or ball bearings on all rotating shafts.**
- **"Oil bath" lubrication.**
- **Drive Motor — standard fractional horsepower general purpose.**

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Technical service representatives in principal cities of the United States, Canada, Mexico and other foreign countries.

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12-inch sluice, 2, $739.05 each; 3-inch plug, 5, $29.56 each; 4-inch plug, 20, $39.80 each; 6-inch plug, 40, $100.06 each; 8-inch plug, 92, $147.81 each; 10-inch plug, 16, $281.98 each.

There were six bidders, and total prices ranged from $1,540,314.69, using prestressed digesters, to $2,140,986.50. The low bidder's price on prestressed digesters was $211,000 against $195,000 for conventional type digesters.

Use Base of Watersphere as Pumphouse

The Village of Aroma Park, Illinois, saved approximately $500 by using the base of a 50,000-gal. Watersphere as the pumphouse in its water system. This village is 65 mi. south of Chicago, on the Kankakee river. Its population is 550 and its area 0.34 sq. mi.

The distribution system consists of 19,400 ft. of distribution mains ranging from 2 to 8 in. in diam. It supplies 140 domestic services, 10 commercial services and 22 fire hydrants. Consumption ranges from 15,000 to 30,000 gpd and averages 20,000 gpd.

Water is obtained from an 8-in. limestone well, 182 ft. deep. The Watersphere, which is 95 ft. 10 in. to the bottom of the water capacity, was built directly over the well.

The base of the tank, which serves as a pumphouse, is insulated and has a ceiling 14 ft. above the floor. It houses a 100-gpm electrically-driven deep well pump and 7½ hp motor, an ion-exchange softening unit, chlorinating equipment, laboratory table, and automatic pump controls. The softener, which has a maximum capacity of 126 gpm, is operated at an average of 50 lbs. per sq. in. and 85 gpm, the hard-water by-pass taking another 15 gpm.

The Aroma Park water system was designed by Decatur, Ill., and installed in 1951. Foreman Wm. T. Warren & Van Praag, Inc., Consulting Engineers of Mullen erected the 50,000-gal. Watersphere, which was fabricated at the Chicago plant of the Chicago Bridge & Iron Co., to whom we are indebted for the above data.

City Builds Parking Garage

Bridgeport, Connecticut, has recently dedicated a municipally owned and operated parking garage and bus terminal. The new structure provides parking space for 500 automobiles on its upper floors and a waiting room and off-street bus loading area on the first floor. The building was erected on city-owned land previously used as a parking lot for 74 cars. It was financed by a $1,500,000 bond issue and is operated by a parking authority of five members appointed by the mayor. Drivers park their own cars in any available marked space on the five floors which includes the roof, all of which are reached by ramps. The minimum fee for four hours is 25 cents and for each additional hour 5 cents. The monthly rate for daytime parking from 7:00 AM to 7:00 PM is $8.—*Public Management.*

Moving a 51-Ft. Steel Bridge 10 Miles

We use a 2½-ton truck and a home made 2-wheel trailer to move a 51-ft. steel truss bridge to a new location. After loading it on the truck and trailer, it took 2 hours and 10 minutes to haul the bridge 10 miles and position it for lowering on the new abutments.—W. C. Calvert, Highway Superintendent, Sioux Falls, S. D.

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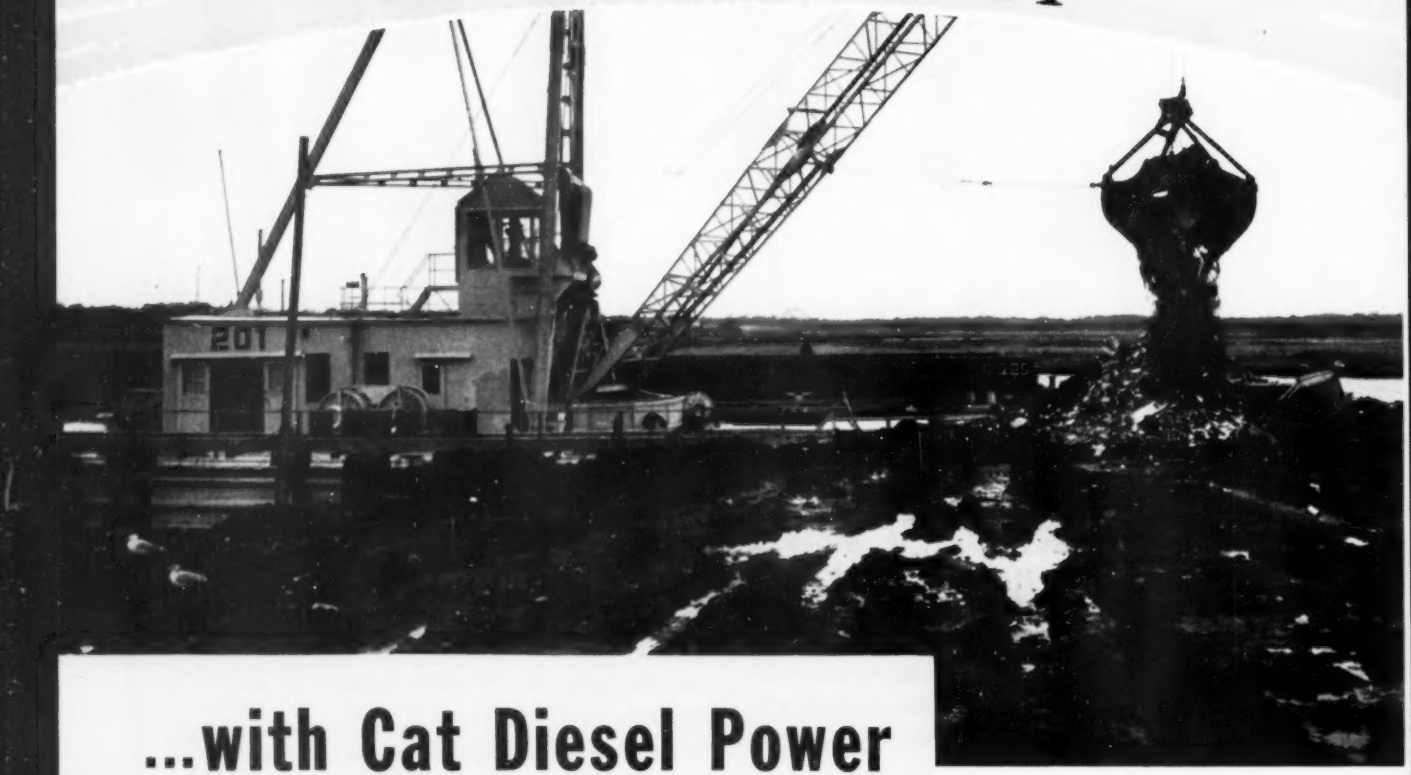

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PUBLIC WORKS Magazine

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Problems of SUBDIVISIONS, ZONING and PRIVATE STREETS

I. RUSSELL RIKER, C. E.
Engineer for Princeton Borough, N. J.

THE Borough of Princeton, New Jersey, is a small municipality, the 1950 Census, including students, showing 12,500 population. We are now believed to have about 75% of our ultimate population under the terms of the maximum density factor in the Zoning Ordinance. There remains only one or two small areas to be subdivided. The entire area of the Borough is less than two square miles, with a large portion used by educational institutions; and it can be considered strictly urban, with the land subdivided and few lots available for building purposes.

There is a total of approximately twenty-six miles of public or semi-public streets of which nineteen are owned by the municipality and three by the State and County. The remaining four miles—thirty-four streets, some of which might be considered alleys—are owned by private interests. Practically all the streets are public streets in that they have been traveled over a number of years and cannot be closed to the public, yet their title is in the hands of some individual or corporation and the municipality is not responsible for their repair or maintenance. They have been considered by local officials from time to time for approval and acceptance as municipal streets but the question of acceptable standards always arises. Regular municipal services, except emergency police and fire, are not given to property owners on these streets which are very often badly in need of repair. At times petitions are presented by the property owners or the municipality has considered them a menace to the general welfare and has instituted action by ordinance to take over and improve them according to certain standards. In such case, the property owners would be assessed according to the degree that the street is used by the general public.

Private Streets

Most of the thirty-four privately owned streets in the Borough are minor streets. Many of them are streets in subdivisions that were approved by the Planning Board before standards covered by bond were required. The developer is no longer interested but the Borough and the residents on the street are. New standards are now set out in detail in the Rules and Regulations for subdivisions and boards are required to make sure they are complied with. The Borough has for many years had a standard for streets to be taken over by the municipality and maintained. These standards have been under attack from time to time, not only by the developer but by property owners who pay part of the cost by assessment.

The width of the right-of-way has not been so controversial as the width of pavement. The width of pavement has been objected to in the past because of the added cost, but recently property owners have objected because they felt that the wider the pavement the more traffic the street would draw. Our minimum width through the years has been 30 feet from curb to curb, with curbs part of the requirement. Such a width is controversial today because it does not meet with required requirements for two parking lanes and two travel lanes. However, we know by experience that it works well for existing residential streets where there is scattered parking on both sides and two-way travel. The accident record is low and maintenance and repair is much better than for a narrower pavement.

There has been a tendency in some circles particularly in planning new subdivisions to make the pavement narrower in new developments, even as low as 20 feet in urban developments. Of course, the old town-to-country road, 22 feet more or less in width, still exists and is approved by authorities.

● TWO LANES FOR parking and four lanes for travel are available on Nassau St.

The latest land subdivision regulations of the Federal agencies, however, recommend a minimum of 26 feet for minor streets and 32 to 36 feet for minor streets where row houses and apartments are located. The 26-ft. street is too narrow for two-way traffic, with parking on both sides of the street; and this, I feel, is essential for well-planned urban streets. We find that by far the majority of towns in New Jersey the size of Princeton, or larger, still require a minimum of 30 feet from curb to curb.

We are now in the process of planning for widening certain street pavements to 36 feet. These streets have become collection streets, with the increase of traffic, and some may be increased to 40 feet. It is, indeed, fortunate when we find one that does not require too much of a change in utilities or destruction of trees. We have always been proud of our trees in Princeton but most of them have been planted on the curb and naturally must be destroyed when the pavement is widened. In some cases, property must be secured and even buildings moved. Princeton, as well as other municipalities, has regulated parking and traffic. We now have 35 streets with parking on one side only, and 11 one-way streets: a very few for short distances have no parking on either side. These parking and traffic restrictions all point to the importance of making our paving wide enough in the first place. The main or arterial streets in the town are principally State Highways over which we have little control. Nassau Street—the main street—which is a State Highway, has for two blocks in the business center two lines of parking and four lanes for travel. There have been many substitutes offered for the wider street, such as offstreet residential parking, but none can replace the wide pavement for all purposes: snow removal, fire fighting purposes and general maintenance. We note that, as far as safety is concerned, the Traffic Engineers for the State, Police Officials and Safety Councils prefer the wider pavement. County Planning Officials also require the wider pavements. We therefore conclude that for a town the size and character of Princeton, the general concensus of opinion is that the pavement should not be less than 30 feet wide, and preferably 34 or 36 feet wide, with a right-of-way from 50 to 60 feet wide.

● **LOOSE STONE curb being reset in concrete for better utility.**

General Standards

It is essential that standards be set up in the requirements for subdivisions and it is best that such standards be adopted by the governing body in the form of an ordinance. In addition to street widths, our ordinance requires that the grade of the streets shall not be less than 0.5 percent or more than 4 percent on main traveled streets nor more than 6 percent on minor streets. We insist that the street be monumented fully before accepting it. Our aim is to limit the length of block to 1200 feet, with 400 feet as the minimum length. For years we have been doing our best to eliminate existing dead-end streets with considerable success but we will permit cul-de-sac streets provided they have a properly designed turn-around paved roadway with a minimum radius for the outside curb of 45 feet and providing further the length of the street shall not exceed 400 feet.

Curbs we believe are essential for proper drainage, to keep the pavement from traveling along the outer edge and for general maintenance including street sweeping and snow removal. Many property owners do not like curbs, not only because they are costly, but because they think these detract from the natural appearance of the landscape. Curbs can be made very attractive by using flagstone or Belgium block or by using a low roll type design. We use almost entirely the straight, conventional curb with 4 inches to 6 inches showing. We believe this is the best from a street maintenance standpoint.

Sidewalks are required in Princeton on at least one side of the street in new developments; but it is difficult to order this to be done on existing streets for there is the question as to which side of the street shall stand the cost of the sidewalk. In Princeton, not only the first cost but repairs are the entire responsibility of the property owner.

Proper shade trees make the residential street attractive and we are proud of the 5000 trees along our streets. We require that shade trees be planted in new developments inside and adjacent to the property line. At present many of our trees are between the curb and the sidewalk. We have no commission, but do have a strong shade tree ordinance controlling the planting and care of such trees. They must not be planted closer together than 50 feet and they cannot be cut or pruned without written permission. We have many elms and have done much work with the U. S. Department of Agriculture and the State

(*Continued on page* 103)

Courtesy Princeton Herald

● **RESIDENTIAL STREET, showing sidewalk on one side and granite block curbing.**

● **SANITARY FILL at Oneonta is hidden in rolling hill country and looks more like a park than a disposal area.**

Sanitary Landfill OPERATED BY CONTRACT

UNDER certain conditions, a satisfactory system of refuse disposal can be conducted for a city by private contractor. With proper equipment and supervision, it becomes an efficient operation—and that means profitable business. The city can dump its refuse problem, with all attached headaches, into the lap of the contractor. Supervision is necessary, of course. But if the city is careful in selecting a reputable party for the job, this supervision can be limited to regular check-ups by the local health officer. State health agencies also like to keep tabs on such operations, and augment local control.

The contract method of refuse disposal by landfill has been demonstrated in the City of Oneonta, New York, where two successful dairy farmers have entered the sanitary fill business. For years, Oneonta was plagued with the usual complaints from citizens who had to put up with smoke and the smell of a burning open dump. Mayor Hughes, Andrew Gobel, the city health inspector, and Messrs. Rock and Cotter, engineers of the New York State Health Department, put their heads together and came up with the solution: A sanitary fill operated by a private contractor with regular inspection and supervision. Competition for the job kept bids down and the city was able to choose a reliable firm at a reasonable figure. Richard and Marvin Simonson, leading dairymen of Otsego County were awarded the contract.

● **BULLCLAM handles two yards of gravelly fill material at each bite.**

What actually happens to Oneonta's refuse is almost a local mystery. About all that anyone sees of the disposal operations is a fleet of thirteen trucks and packers. These pick up the unseparated refuse and haul it out of town. The collection vehicles, also operated by a private contractor, haul an average of two miles to the dumping site. While the haul is comparatively long, it is almost entirely over a new state highway, and little time is lost on the road. The sanitary fill is being built on a hilly, ten-acre tract on the Simonson farm. There has been talk that eventually the site will be part of an airport, and the land is being worked with that possibility in mind. However, Greater Oneonta, with a population of 18,000, will be able to use this site for about twenty years. On the other hand, if conditions warrant, the area can be cleared and leveled immediately. The present contract covers ten years.

The site is part of a glaciated area composed almost entirely of sand and coarse gravel. To handle

(*Continued on page* 104)

USING WATER DEMANDS to RATE TELEVISION PROGRAMS

GEORGE J. VAN DORP,
Water Commissioner, Toledo, O.

FOR some years the operators of the water works plant of the City of Toledo, Ohio, have had difficulty in keeping up with and satisfying the varying demands for water at suitable pressures during the evening hours.

Repeatedly during these evening hours the pumpage load on the plant would very rapidly increase —at times as much as 25 or 30 percent within a period of five minutes. Since the pumps are driven at constant speed and are of the turbine or centrifugal type, this increased demand sometimes imposed a load which exceeded the capacity of the pumping units in service. Then it became necessary to change over and add a larger capacity to the pumps already in operation. Often, to the consternation of the operating engineer, the demand for water would again quickly drop and it would be necessary to reduce pumping operations. All of this, besides being very annoying to the operator, added to the cost of operation; and it also resulted in complaints about the large and varied pressure fluctuations on the water system.

Early in 1952 it became evident that this condition had become serious to the point that something had to be done about it. The city water main system was divided into specific sections and, by means of gauges for testing pressures and water flows, the search for the misbehaving large water consumer was begun.. Many times the department thought that it was on the verge of discovering the miscreant, but each time a section of the system was zoned off it appeared that the condition had largely shifted to some other part of the city. The investigators finally, in despair, brought their charts, maps and figures before the head of the department for examination and discussion. It was there found that apparently these changes in water demands occurred with definite frequencies, and further that they happened most intensely and consistently on the half or whole hour. Further checking with the local newspaper indicated that these conditions varied widely in their intensity with certain and varying television programs. At last we had found the culprit!

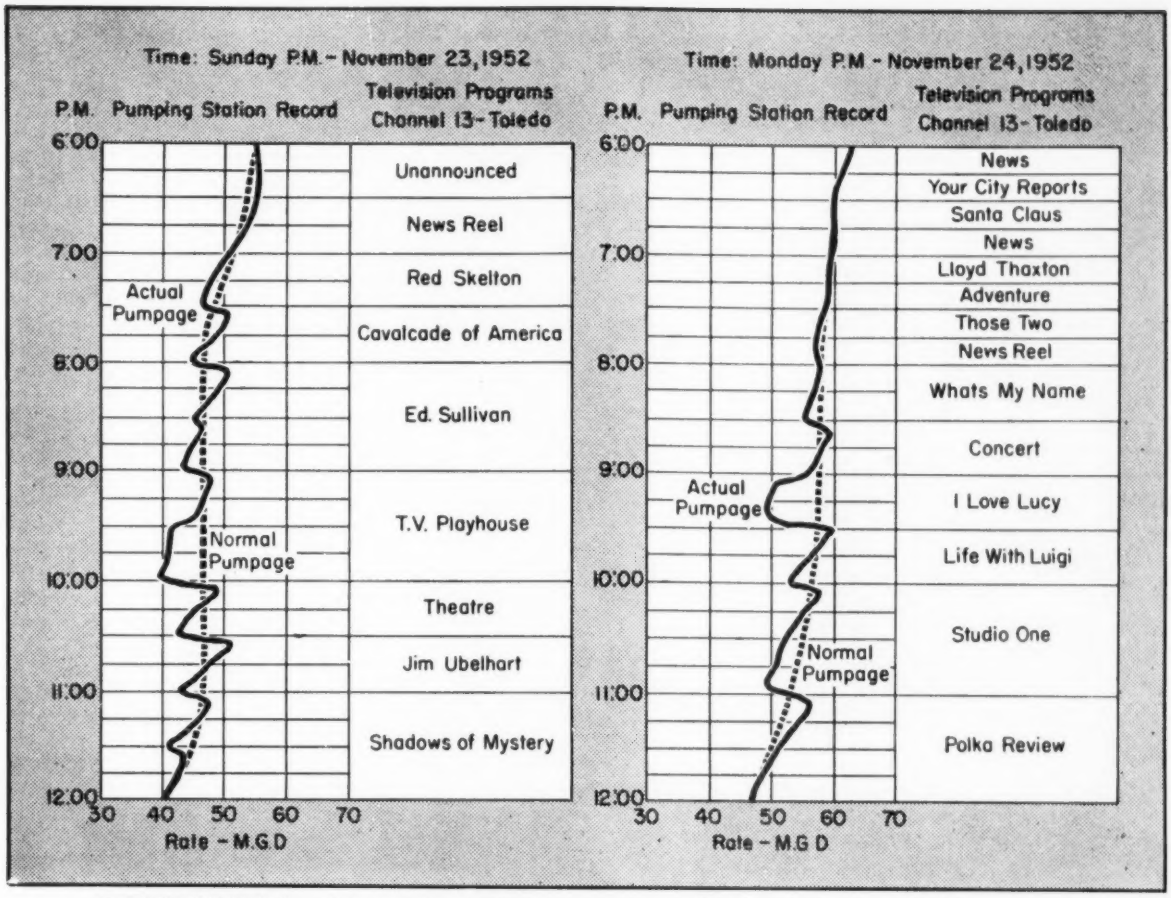
What the Charts Showed

Examination of charts constructed for a study of the condition, to the end that some remedy might be found or corrective measures applied, brought to light the fact that the fluctuations in demand were the direct cause of the activities of the people (water consumers) who, after having had their interest held by the program on the air, were at the end of the program or during the commercial, suddenly released. They then became engaged in many activities which were water con-

TABLE 1—TELEVISION PROGRAM RATING BY THE WATER USE METHOD

Time P.M.	*Program*	*Minutes Duration*	*D Pumping Drop*	*R Pumping Rise*	*V Volume*	*L*	*"W" Rating Equation for*	
Sunday November 23, 1952							*Toledo*	*All Cities*
7: - 7:30	Red Skelton	30	4	4	14	14.7	54.0	54.7
7:30- 8:	Cavalcade of America	30	6	6	0	0	60.0	60.0
8: - 9:	Ed Sullivan	60	8.5	6	22	11.5	83.5	84.0
9: -10:	T.V. Playhouse	60	7.5	9.5	42	22	106.0	107.0
10: -10:30	Theatre	30	7	9	1	1	76.0	76.0
10:30-11:	Jim Ubelhart	30	9.5	5	-9	-9.4	63.5	63.0
11: -12:	Shadows of Mystery	60	7	0	1	1	36.0	36.0
Monday November 24, 1952								
8: - 8:30	What's My Name	30	3.5	5	10	10.5	42.5	53.0
8:30- 9:	Concert	30	7	0	2	2.1	37.0	37.1
9: - 9:30	I Love Lucy	30	4	10.5	57	59.7	129.5	132.2
9:30-10:	Life With Luigi	30	6.5	4.5	2	2.1	57.0	57.1
10: -11:	Studio One	60	8.5	7	22	11.5	88.5	89.0
11: -12:	Polka Review	60	9	0	8	4.2	53.0	53.2

See equations on opposite page



● **THESE CURVES show the normal and actual water pumpage plotted against various television programs.**

suming, thus increasing the load on the water department, after which they could again return to the living room to give their undivided attention to "I Love Lucy", "Arthur Godfrey" or "Ed Sullivan".

It further became apparent to the writer that the intensity of the changes varied with different types of programs or persons presented on the air and that, therefore, these fluctuations might possibly be used to indicate the popularity of the programs because of the degree of intensity and time in which they were able to hold the people.

With this in mind the writer has developed a system of rating these programs which is based on variations of pressures and pumpages. Because this rating appears to indicate the popularity of the program through the medium of use of water we shall call it the "W" rating of television.

Empirical formulas have been worked out to include all of the factors of population, pressures and pumpages, local per capita con-

(*Continued on page* 112)

EQUATIONS FOR RATING TV PROGRAMS FROM WATER PUMPAGES

Equation Applicable to Toledo

For 15-Min. Program, $W = 5(D + R) + 2V$
For 30-Min. Program, $W = 5(D + R) + V$
For 60-Min. Program, $W = 5(D + R) + \frac{1}{2}V$

Where D = maximum drop in MGD rate of pumpage during program; R = maximum rise in MGD rate of pumpage at end of program; and V = net value of area between actual pumpage line and normal pumpage line on chart. Above-normal areas are minus; below-normal areas are plus. Ed. Note: Mr. Van Drop plotted the pumping rate curve so that one unit of area (one "V" unit) represents 3 minutes at a 1 MGD rate or 2083 gallons; for other scales the equations should be adjusted accordingly.

Equation Applicable to All Cities

$$W = 5(D + R) + L$$

Where D and R have the same meanings as above, and

$$L = 10\ G\ F \div T\ C$$

G = Gallons = V x 2083 = 1 MGD rate x 3 minutes time; T = time duration in minutes; C = population served in water district in thousands (in Toledo C = 361); and F is a factor equalling the ratio of percent of domestic consumption over industrial consumption (Toledo = 35.25/64.75 = 0.545)

Air-Placed Concrete Speeds LARGE SEWER CONSTRUCTION

WORK on an important extension to the Indianapolis sewer system was begun last summer. This project involves the installation of 14,888 ft. of trunk sewer line and 21,521 ft. of sewer extension. Reinforced concrete pipe is being used throughout. Trunk line pipe ranges from 15-in. to 156-in. inside diameter. All pipe is being furnished by the Independent Pipe Company of Indianapolis.

● **GROUTING CREW seals joints quickly with Bondactor, permitting bulldozer in background to backfill promptly. Below: Another view of joint grouting.**

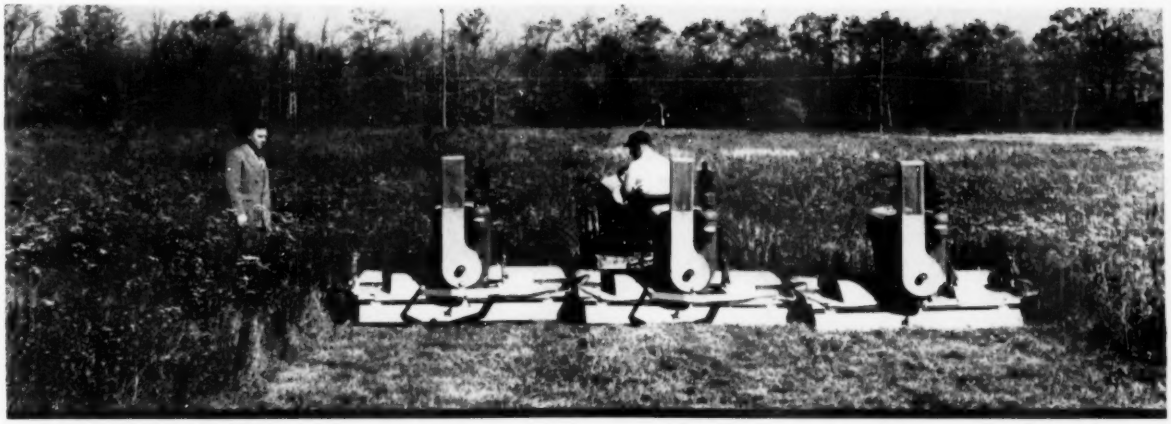
The Board of Works of Indianapolis, headed by William R. Hunt, City Engineer, and Raymond C. Cassady, City Sewer Engineer, awarded the job in three separate contracts. The East 34th Street main sewer line, consisting of 14,888 ft. of 15-in. to 156-in. pipe, went to the Square Construction Company and the Angelo Marra Construction Company, both of Indianapolis, as a joint venture. The laying of the first extension, consisting of 9,400 ft. of 15-in. to 102-in. pipe, was awarded to Raleigh Burke, Indianapolis contractor. Laying of the second East 34th Street sewer extension, consisting of 12,121 ft. of 15-in. to 90-in. pipe, was awarded to the Columbia Construction Company of Indianapolis.

An interesting aspect of both extension jobs is the use of gunned or air placed concrete for the grouting of both outside and inside pipe joints. The Bondactor, manufactured by the Air Placement Equipment Company of Kansas City, Mo., is being used for this pipe grouting by both the Raleigh Burke and Columbia companies. This equipment operates from an air compressor and "shoots" hydrated cement and sand under pressure against the joint surface to give a smooth, dense, non-porous extremely strong deposit at a rate up to five times faster than manual methods that have been used previously.

On the East 34th Street sewer extension jobs the Bondactor and crew work immediately ahead of the dozer covering the pipe ditch. Pipe used is designed with an open joint at the top which is grouted with the gunned concrete. After this outside top joint is grouted, the gun and the hose are inserted through a hole purposely left at the top of pipe and the inside joint is then grouted from inside the pipe. The gun and hose are then removed through this top hole and the hole is sealed with air-placed concrete. This completes the grouting operation. Grouting aggregate used is a mixture of one part cement and four parts sand.

Using this mechanized grouting procedure, both Raleigh Burke and Columbia claim a substantial speed-up of their pipe grouting operation.

An unlooked-for, but non-theless profitable use for the Bondactor equipment was also discovered on this job. In the unloading of the pipe on the job site, some sections were chipped and otherwise damaged. These holes and chips were speedily repaired with air-placed concrete. These repairs are of such strength and soundness that the repaired sections are readily accepted for use by the supervising engineers. In this way, a considerable length of pipe that would otherwise have been scrapped is being salvaged for use.



● **ROTARY MOWER with three units cuts more than 17 ft. wide, and has reduced roadsides mowing costs 50%.**

REDUCING THE COST OF ROADSIDE MOWING AND SHOULDER MAINTENANCE

R. C. BANNERMAN, JR.,
Engineer of Maintenance,
State Road Department of Florida

OUR experience in maintenance over the past few years has been that labor is hard to get—particularly labor that is willing to give a full day's work. In view of this scarcity and high cost of manpower, it has become necessary to do as much of our work as possible with machinery. Our greatest developments along this line have been in the fields of shoulder and slope maintenance and roadside mowing.

We have always had a considerable problem of shoulder erosion throughout the entire state. To repair such damage required either hand labor to fill in the holes and dress up the washed-out area, or it was a dragline and truck job. Most of this work is now handled by labor-saving equipment. When the shoulders have become eroded, we harrow or disk them and then follow with a small motor grader with a 10-ft. blade to shape the shoulders and slope. In cases where erosion is severe, we use crawler-mounted front end loaders, together with trucks, for taking the shoulder fill from a borrow pit. We encourage the field engineers to study the roadside locations where fill dirt is necessary for the shoulders and to use the front-end loader to cut a gentle backslope, using the dirt for the shoulder fill. In such cases, stumps are removed and underbrush cut. This procedure, therefore, not only corrects erosion of the shoulders, but also puts the backslope into condition for machine mowing.

Mulching for Erosion Protection

During the past two years, our state has rehabilitated 200 to 300 miles of shoulders and front slopes with disks, motor graders and front end loaders, utilizing a mulching process. This mulching is nothing new to agriculturists but in this section of the country it is new for road-building purposes. It consists of applying 2 to 3 tons of hay or straw per acre uniformly over the shoulders and front slopes immediately after the area has been properly shaped and grass sprigs placed. This hay or straw, when spread evenly, gives a loose thickness of 2 to 3 ins. and, when possible, it is cut into the soil about 2 ins. to give a loose mulch depth of about 4 ins. For cutting into the soil, we usually use a rotovator, which is power driven, behind a Ford rubber-tired tractor. A set of disk harrows will often answer the same purpose.

After the mulch has been cut into the soil, we apply two grades of grass seed: Usually Common Bermuda at the rate of 20 pounds per acre and Common or Pensacola Bahia at the same rate. As soon as this seed is applied, the entire

(*Continued on page* 89)

● **SMALL POWER mower is effective for parkway and dividing strip mowing.**

Flow Characteristics and Roughness Coefficients of SEWER PIPES

KENNETH W. COSENS,
Assoc. Prof. of Civil & San. Engrg.
Ohio State University

ROUGHNESS, flow coefficients and flow characteristics were determined for two common sewer pipe materials as a project of the Ohio State University Research Foundation. The pipes tested were 8-in. diameter, standard strength, vitrified clay and Class I asbestos cement. Shipments of both pipe were from regular stock; no irregular pipe was used in the test. Roughness was compared by measuring velocity, slope and hydraulic radius and then computing the value of the roughness coefficient "n."

The 3-ft. lengths of clay pipe were jointed with jute and cement mortar: the 13-ft. lengths of cement-asbestos pipe were jointed with a cylindrical roll-on joint using two rubber rings. A trestle supported the 300-ft. long pipe during the test. This was so constructed as to permit very accurate adjustment of grades. Tests were made at grades of 0.25 per cent and 0.40 per cent. Water for testing was delivered by a centrifugal pump, equipped with a throttling valve, from the Olentangy River to a 1000-gal. stilling tank which discharged into the pipe line. At the lower end of the line was another 1000-gal. tank, discharge from which was measured by a sharp-crested V-notch weir. To reproduce actual construction conditions, 6-in. wyes were placed at about 25-ft. intervals, at a 45° angle, on alternate sides of the line. Recommended practices for the two types of sewer pipe were used. The wyes were then plugged so no water was lost during the flowing-full tests.

All calculations involving pipe diameter were based on actual pipe measurements of 0.667 ft. for clay pipe and 0.651 ft. for asbestos cement.

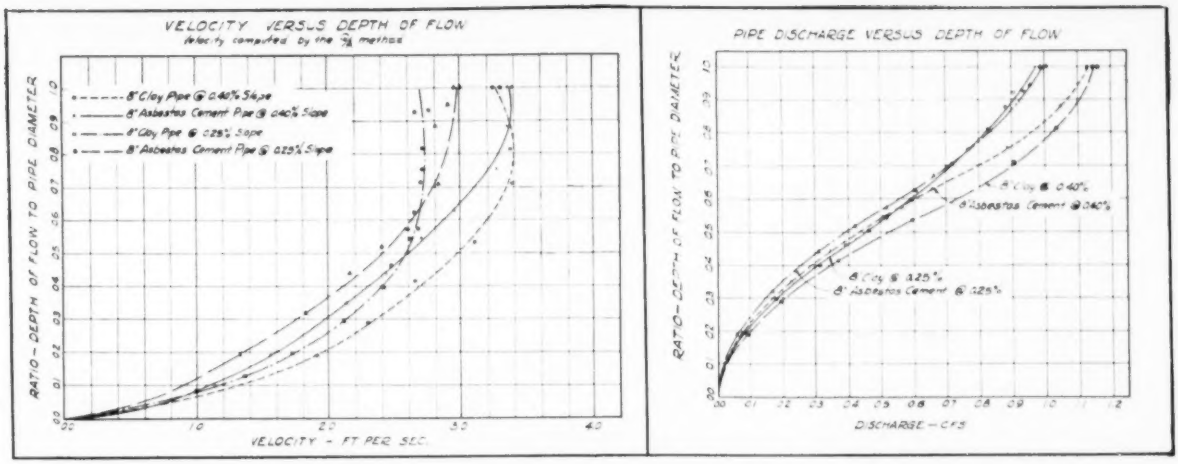
Each pipe was accurately set on the specific grade selected and leveled to within a few thousandths of a foot of exact grade at every 25-foot station throughout its entire length. Seven hook gage stations, located at strategic points along the flume were installed to measure accurately the depth of flow in the pipe line at each gage station. Two additional hook gages were set up at the discharge tank to measure precisely the head on the V-notch weir.

● **VITRIFIED clay sewer pipe at 0.40 percent slope. Two hook gauges measure head on V-notch weir. Other hook gauge stations are shown along the pipe line.**

Each pipe line was tested by allowing water to pass through the line at various depths of flow, from about one inch deep to flowing full under pressure. Only one run, for each slope, was made flowing full, under pressure. The rest were made with the sewer pipes flowing partly full and functioning as open channels. Water temperatures were recorded for each run.

It was a simple matter to maintain a uniform rate of flow (the discharge being constant) by means of the throttling valve on the pump discharge. Velocity in the pipe lines was checked by inserting a brine solution at a point near the upper end of the flume and noting the time required for the brine slug to traverse the pipe line. The presence of brine at the low end was detected by means of an electrical conductance apparatus. Measurement of velocity by the salt solution method was used only as a check of the velocity as measured by the Q/A method.

Profiles of the water surface for each run were plotted and energy gradients developed for the middle 140-ft. section of the flume. Turbulences and irregular water surfaces were noted in each 80-ft. end section so these were disregarded in the computations. The discharge weir was calibrated and a rating curve and discharge formula developed. Mean pipe line velocity was computed for each depth of flow by determining the discharge



● **CHART AT LEFT, Fig. 1, shows velocity as related to depth of flow; at right, Fig. 2, discharge versus depth of flow.**

and dividing it by the cross-sectional area of flow. Slope was computed as the slope of the energy gradient for each run. These values were then inserted in the Manning formula, rearranged to give the value of the roughness coefficient "n".

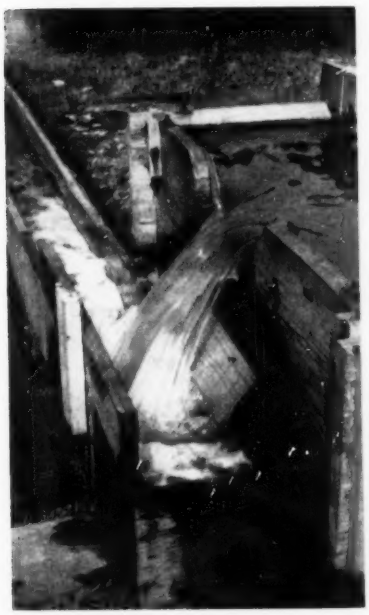
$$n = \frac{1.486}{V} r^{2/3} S^{1/2}$$

It is of interest to note that the velocities measured by the salt solution were generally slightly lower than those by the Q/A method. In measuring by the salt method, two stop watches were used. One measured the time required for the slug to reach the electrodes; the other the time for the slug to pass the electrodes. The time of flow was taken as the average of these two intervals. This method was used only as a general check.

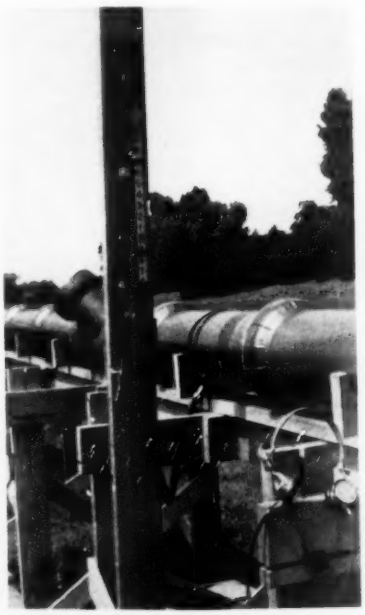
The values determined for "n" were all between 0.0085 and 0.012. There appeared to be a tendency for "n" to increase as the slope was increased, but the slopes used in this investigation were relatively flat and data on such increase are therefore lacking. Fig. 1 shows the variation of mean velocity, as measured by the Q/A method, with depth of flow, pipe material and slope. It will be noted that for all slopes and all materials, the velocity was near or above 1 fps when the depth of flow was above the 0.1 diameter ratio. Also, that velocities flowing full and flowing half full are not equal; and that, whereas at half-depth the clay pipe velocity was greater, this condition was reversed when the pipe was flowing at full depth.

The variation of pipe line discharge, for both materials and at both slopes, for all ratios of depth of flow, is shown in Fig. 2. As in Fig. 1, the two pipe materials are shown to perform somewhat differently under different conditions of depth of flow.

The values of the roughness coefficient "n" determined in this study are for new, clean, well-aligned pipe, with river water of low turbidity and of relatively high temperature (averaging between 85° and 90° F). The study indicates that the roughness coefficient for the two materials is the same. It is the writer's opinion, moreover, that after usage in a sewer system, the coefficient of roughness will tend to become a coefficient which measures the condition of a slime-coated pipe line. Thus, regardless of the material used, the value of "n" should be the same for any given slope, depth of flow and pipe diameter. Further study is needed to determine the effect of steeper slopes and of larger diameter pipe; and of use under service conditions, for pipes some time in service are undoubtedly not as smooth as new pipe.



● **WEIR which measured the flow from the effluent tank was carefully calibrated and a discharge curve developed for quick use in making calculations.**



● **ONE OF the hook gauge stations along pipeline. In foreground is the salt solution apparatus used to measure flow velocity.**

C. E. WRIGHT

WATER FROM INSIDE-CITY WELLS

● ***Jacksonville, Florida is fortunate in having its water supply directly underground. This article describes late improvements. New 44 wells supply up to 125 million gallons per day.***

ARTESIAN wells furnish the water supply for Jacksonville, Fla., which has a population of 204,000 and is one of the few cities in the United States that is situated right on top of its water supply. The artesian wells, sunk to a depth of 1100 to 1300 ft., yield water of such bacteriological quality that it requires no treatment other than aeration and detention, to remove hydrogen sulphide, and the usual chlorination.

Despite a population growth which has averaged about 3000 persons a year, plus a considerable business and industrial expansion, Jacksonville has not had to go outside its urban limits for an abundant supply of water. But it has not overlooked the possibility that future growth might at some time require supplemental surface sources. Accordingly, it has, since 1924, been maintaining stream gauging systems on Black Creek, a spring-fed tributary of the St. Johns River; and on the St. Marys River, which rises in the Okeefenokee Swamp in south Georgia. These gaugings have been made with the cooperation of the U. S. Coast and Geodetic Survey.

However, Jacksonville's present water supply system has proved so satisfactory as to quality, quantity and economy that an expansion program costing $5,000,000 is now approaching completion, and a standby fund of $2,000,000 is being used for pay-as-you-go improvements over the next few years. These expenditures will create a sufficient pumping and distribution system capacity to take care of anticipated requirements to 1960.

The number of wells has been increased from 34 to 44; pumping capacity has been raised from 68,000,000 to 125,000,000 gal. per day; and ground storage capacity has been increased from 11,500,000 gal. to 19,000,000 gal., allowing a considerable margin of safety over the 45,000,000 gal. a day now being consumed.

As Jacksonville operates under a system whereby all profits from municipally-owned power and water facilities, beyond maintenance, operating and amortization costs, are returned to the city's general fund, every major expansion must be authorized by public referendum so that the necessary revenue bonds may be issued. The waterworks program was approved in 1948, authorizing issuance of $5,000,000 in revenue certificates for the major part of the work and setting aside of additional sums, if earned, for requirements beyond that expenditure. To meet increased operating costs and amortization requirements, a 50 per cent increase in water rates was approved by the voters. This rate increase has covered the bonded indebtedness thus far and promises to supply an additional $2,000,000 within the anticipated time.

So long as the underground supply holds out, Jacksonville will be able to get its water at a much lower cost than would be possible if the closest available surface sources, such as Black Creek and the St. Marys River, had to be tapped. An advantage of the present system is that the supply can be increased merely by sinking new wells and without extensive enlargement of mains. On the other hand, recourse to surface water would require construction of expensive aqueducts, a tunnel under the wide and deep St. Johns River, which bisects the city, and a large expenditure for a treatment plant.

Of the four major Florida cities, Jacksonville, Miami and Orlando obtain their water from underground sources. Tampa, which taps a surface source, the Hillsborough River, has to use extensive treatment owing to discoloration by organic matter at certain seasons. Orlando well water also requires extensive treatment, chiefly because lakes within the city are used for storage reservoirs. Miami water, coming from wells about 100 ft. deep, is also treated. Jacksonville's underground supply is deeper than most of the Florida wells and is filtered through a heavy limerock formation; thus nature does what has to be done mechanically in some other areas.

An oddity of the overall Florida water supply situation is that, while the state has the second largest surface water area in the United States, it also has one of the largest subterranean water areas in the coun-

● **PUMPING stations are attractive—all are identical in appearance and design.**

● **ONE OF the new elevated tanks. This one has a capacity of 1 MG.**

try, and most of its public and private water supplies are drawn from underground rather than surface sources. Of the 357 public water systems in Florida, 325 derive their water entirely from wells.

Thus far there has been no serious diminution of the underground supply, but the water table in some coastal areas has dropped dangerously low in dry seasons. This fact impelled the St. Joe Paper Co., in tripling the size of its plant at Port St. Joe, on Florida's west coast, to build a $2,000,000 water canal, 18½ miles long from the Chipola River, rather than risk a further drawdown of the well water table. Its daily requirements will expand soon from 9,000,000 to 30,000,000 gal. At Fernandina Beach, northeast of Jacksonville, where there are two large pulp mills, the water table has also reached a low level at times. In the Jacksonville area, the piezometric level above sea level, at one time 70 ft., is now down to 50 ft.

The Jacksonville expansion program has, in addition to the sinking of ten new wells, involved the deepening of some of the older wells; the construction of two completely new pumping stations; the construction of five pumping station buildings with new mechanical equipment; the building of seven ground storage reservoirs; installation of five enclosed atmospheric spray-type aerators with Infilco floating cone-type nozzles; and the erection to date of five steel elevated storage tanks which have increased elevated storage capacity from 1,500,000 to 3,000,000 gal.

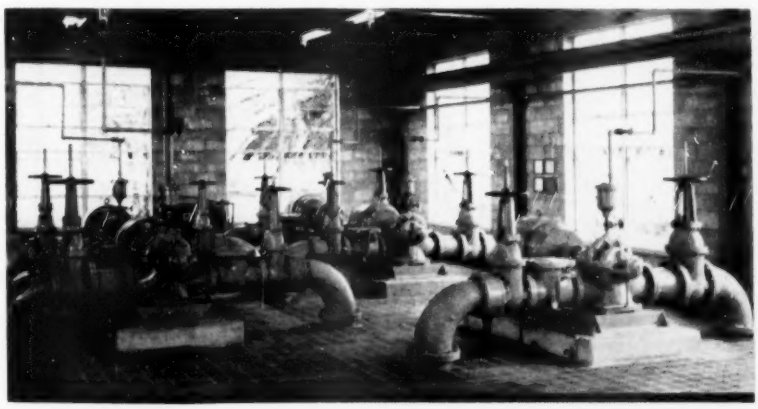
All wells have surface-mounted, electrically-driven centrifugal pumps to deliver water from the well to the aerator at the nearest pumping station, in some cases a distance of 2500 ft. or more. Aeration alone has not been found sufficient to remove all of the hydrogen sulphide in the water; hence this process is followed by four-hour detention in settling tanks before chlorination and pumping into the system. Small pump houses over the wells protect the pumps from wind, rain and dirt. Some of the pumping stations are identical in both exterior and interior design, but the mechanical layout is standardized so that when operators are transferred from one station to another, a common practice of the Jacksonville water department, they will have no difficulty in familiarizing themselves with a system which varies even in the slightest degree. The pumps used are of several different makes, including Allis Chalmers, De Laval, Fairbanks-Morse, Peerless and Worthington. The pumping stations are equipped with Simplex Venturi tubes and Type MO recorders for master meters. All instrumentation for recording water levels and pressure in elevated tanks is by Bristol.

Final completion of the program was delayed somewhat by the midsummer steel strike. This affected particularly the erection of steel storage tanks. When the strike started one 1,000,000-gal. tank had been completed on the city's north side and a 500,000-gal. on the south side, both by contract with the R. D. Cole Co. An additional 500,000-gal. tank is under contract. Two others are to be built, each of 500,000 gals.; and one existing tank is to be moved.

Other improvements that have been completed include strengthening of the distribution network, including new feeder mains. About 65 miles of cast iron pipe have already been laid at a cost of about $1,750,000.

Although the Jacksonville electric department distributes power to all of Duval County, water distribution is presently confined to the metropolitan area. However, by legislative enactment the city has been given authority over the underground water supply in the entire county, outside of such smaller communities as Baldwin, Jacksonville Beach, Neptune Beach and Atlantic Beach, and thereby exercises a watchdog policy over sinking of wells outside the city limits. Much of the residential development in recent years has been in suburban subdivisions and care has been taken to see that the water supply for such new areas does not conflict with that used for the city system. Hydraulic analyses that have been made on the fringes of the municipal system indicate ample capacity for further extension.

The Jacksonville program has been carried out under the supervision of J. Dillon Kennedy, city commissioner of utilities, whose staff in direct charge of this work consists of Robert B. Cowan, Engineer-Manager; C. H. Helwick, Superintendent of Water Department (operation and maintenance), and C. Washburn Jr., Chief Engineer of the Electric and Water Utilities Engineering Department (in charge of new construction). Reynolds, Smith & Hills of Jacksonville were the consulting and designing engineers.



● **MECHANICAL layout of pumping stations is standardized so that operators can be switched from one to another without special orientation and training.**

How Equipment Lowers Cost of Highway Maintenance

C. W. ROSS, Engineer of Maintenance, Illinois Division of Highways

EFFICIENCY of maintenance options has increased as improved equipment has been used; and it has been noticeable that with the increased use of machines, there is a lowering of the cost of doing the work.

Equipment which has been found to be exceptionally efficient for shoulder grading and ditch cleaning are motor patrol graders with 10-foot and 12-foot blades. Accompanying the graders are power loaders, either of the force feed belt conveyor type or tractor mounted endloaders. The number of trucks used varies with the amount of material to be moved and the length of haul, but for force feed belt conveyor loaders at least four or more State-owned dump body trucks are used. These are sometimes supplemented by privately owned trucks into which the dirt is loaded free of charge for hauling and disposal. The dirt is used on the highways wherever it is required for widening of roadway fills, reconstruction of embankments or filling of excessively deep ditches. After highway use, adjacent property owners are given first choice. Light motor patrol graders and pull type graders, endloaders mounted on crawler tractors, and also endloaders mounted on tractors or power mowers are employed along with two or three trucks for loading and hauling on small jobs.

The Illinois Division of Highways owns 72 motor patrol graders, 32 belt loaders, and 54 endloaders attached to tractors.

Mowing Roadsides

For mowing the rights of way of the 14,000 miles of State highways, the State owns 600 power mowers. These vary from 11 hp. to 25 hp.

The tractors are of the industrial type. These have 5-foot cutter bars which can cut 90° above and 45° below horizontal. At a certain stage of its growth blue grass becomes tough and wiry. The cutter bars of the mowers clog, requiring many stoppages for cleaning, causing loss of time and also failure to get a clean mowing job. Tall weeds and heavy growth of high grass when cut by the sickle bar type mower sometimes cause damage to underlying grass by shading it from the sun. During rainstorms this material washes down grades and clogs gratings. If it can be cut to fine pieces it will form a mulch through which the underlying grass will grow uniformly. During 1953 a number of horizontal spinner type mowers will be tried out to find if they will improve the appearance of the roadsides after mowing by reducing the cut grass to a fine mulch.

Of our tractor mowers, 308 are equipped with small endloaders. These are used successfully for loading trucks with cinders during snow and ice storms and for small dirt moving jobs where only one or two trucks are required.

The Division of Highways has purchased 35 gasoline power operated chain saws. These have been found especially efficient in the removal of dead and improperly located trees, and in cleaning up after windstorms.

There are five power operated cranes that are State-owned. They are used with clamshell and dragline buckets for cleaning wet ditches and stream channels which cannot readily be cleaned with motor patrol graders, and for a variety of other purposes.

Snow and Ice Control

For spreading cinders on slippery pavements during winter months there are available 62 large trucks equipped with power operated hopper body type cinder spreaders. The requirements of traffic for safe driving throughout the winter months requires very prompt service in the cindering of steep hills, sharp curves, railroad grade crossings, paved intersections and similar locations. The large box-type, power operated, cinder spreaders have been found efficient in operation and they are used principally around the larger cities for the benefit of metropolitan area traffic. There are also 178 spinner type and 401 gravity feed tailgate spreaders that can be attached to highway trucks.

Experiments with the crushing and screening of cinders to prevent the spreaders from choking with clinkers, brick bats, and other oversized material have been made. So far the development of equipment for crushing and screening cinders has not approached the efficiency desired.

Also, in connection with the control of ice and snow the maintenance section trucks are gradually being equipped with salt spreaders attached to truck tailgates. The salt spreaders so far purchased or made have not given the possible maximum of efficiency under all weather and operating conditions. Experiments in the development of salt spreaders is under way and larger quantities of salts both sodium and

● **PATCHING** A big hole in a pavement, using a bituminous mix produced by a Barber-Greene Mixall.

● **FRONT END** loaders are used for many purposes. This Hough loader is handling large size drainage pipe.

● **AFTER DITCH** is cleaned with a motor grader, an Adams Traveloader picks up the material and loads into trucks.

● **WEED SPRAYER lifts quickly over top of normal roadside obstructions.**

calcium chlorides are being used each winter.

There are three street sweepers in use for the cleaning of curbs and gutters in metropolitan areas. These, of course, have been found to be more efficient than hand cleaning. They can also be used for cleaning the floors of bridges and viaducts.

Fifteen power operated mud jacks are used for filling cavities under pavements and gutters and for raising settled places along the pavements. In experienced and capable hands these are efficient machines.

Repairing Pavements

For the repair of broken concrete pavements, a change in the method of operation is gradually taking place for those areas where the breakage is not too severe and where it extends for distances of 50-feet to several hundred feet along the road. These sections of roads are being resurfaced with asphaltic concretes Instead of repairing the individual breaks, 1½ inches to 3 inches of asphaltic concrete is placed over the entire pavement covering the length of the broken section. For spreading this asphaltic concrete over the old road surface five asphalt spreaders of simple but effective design have been purchased. Mixed asphaltic concrete is usually purchased from an asphalt mixing plant and hauled and spread by maintenance or force account crews and compacted with road rollers.

In addition to purchasing asphaltic mixes from contractors who have set up temporary and permanent plants, the Bureau of Maintenance also uses asphaltic mixes made in 90 small State-owned asphalt mixing machines. These units are used at scattered locations where commercial plant mixes are not available. The quantity of these materials required for breaks at scattered locations is generally too small to warrant installation of larger plants and the greatest needs for mixes of this type is during the months of February, March and April when the larger plants are not in operation. It is during this period that the subgrades thaw out and become soft often resulting in pavement breaks that develop into hazardous chuck holes.

These breaks must be filled promptly to prevent accidents even though they are small in area, and it is for this purpose that the small mixers are used. Recently two small combination mixers and driers were purchased for this type of work. One problem in connection with the manufacture of small quantities of asphalt mixes is the need for dry aggregates and to solve this problem 21 small aggregate driers have been purchased. There is a need for increasing the efficiency and mobility of these small mixing and drying machines.

● **SMOOTHING and finishing a wide shoulder in one operation with an A-W grader. The machine is offset. Job is on State Route 34.**

For sealing cracks and filling construction and expansion joints, the Division of Highways owns 800 oil-fired, 165-gallon capacity, asphalt heating kettles. The cans used for pouring the heated asphalt into the cracks and joints remains a problem as to design and efficiency.

For small maintenance jobs of spreading asphalt along road shoulders, side roads, intersections and similar places, the Division of Highways uses 31 distributors of 300 to 600-gallon capacity. Most of these are the two-wheel type, towed by trucks, but during the last year three 300-gallon capacity units that are mounted on two axles were purchased. In addition to using these larger heaters for spreading asphalt they are also used for subsealing the pavements to prevent pumping. All of these heaters are equipped with motorized asphalt pumps, spray bars and hand sprayers. The slowness of filling these distributors from 50 gallon drums is a hindrance to the efficiency of their

(*Continued on page* 97)

● **PATCHING a pavement, using a McConnaughay mixer and a compactor.**

TRICKLING FILTER APPLICATION TO INDUSTRIAL WASTE TREATMENT

EDMUND B. BESSELIEVRE, Chief Sanitary Engineer, International Sales, The Dorr Co.

THIS article discusses primarily the treatment of liquid industrial wastes on trickling filters independently of other liquid constituents. There is, however, the definite possibility in many cases that those types of industrial wastes with reasonably large percentages of organic solids content may be treated in combination with the municipal sewage of communities, or with the sewage contributed from the workers of an industrial plant.

Where the total volume of such industrial wastes is small in proportion to the volume of sewage to be treated, or where the wastes do not contain substances inhibitive of aerobic bacterial action, the normal operation of trickling filters in biological sewage treatment plants will not be adversely affected.

For instance, assume a community with a total daily flow of 10 mgd of sewage, with a BOD of 275 ppm. Add to this an industrial waste flow with a total volume of 250,000 gpd with a BOD of 2000 ppm. The raw sewage BOD alone amounts to 22,935 pounds per day. The total additional BOD of the industrial waste flow is 4,170 pounds, or less than one-fifth the BOD of the sewage flow. If arrangements are made to provide storage facilities for the industrial waste flow and to distribute the total flow over a period of 24 hours, the total BOD to be handled by the sewage treatment plant will be 27,105 pounds which is an average of 325 ppm. In any well-designed plant, this will not upset the normal schedule of operation.

The trickling filter is adaptable to the treatment of municipal or domestic sewage regardless of volume. This is not true for all liquid industrial wastes but it is true of any wastes which are primarily of an organic nature and do not contain ingredients inhibitive of aerobic bacterial action. Also, any industrial waste which may be normally inhibitive may be adjusted and corrected by preliminary treatment phases so that the resultant effluent may be treated on the filter.

Where the trickling filter is indicated as an economic and practical means for treatment, the selection of the type of trickling filter—high rate or low rate—depends upon the factors that apply to the treatment of normal municipal sewage, that is: the amount of BOD to be removed per day; the amount removed by the primary treatment units; the loading factor; the recirculation ratio in the case of high rate filters; and the area available or considered reasonable for the treatment plant.

Whereas municipal sewage flows are calculated in millions of gallons per day, the flow of industrial wastes will frequently be counted in the thousands of gallons per day. This, per se, would perhaps lead to the belief that trickling filters for such treatable wastes would be small. This is not necessarily the case. A normal municipal sewage will have a BOD between 250 and 400 ppm or 2085 to 3336 pounds per million gallons per day, but it is not uncommon for an industrial waste to have a BOD of 4000 ppm, and in some instances BOD is as high as 30,000 ppm. This means 33,600 to 250,000 pounds of BOD per million gallons of waste. The trickling filters for such high organic loadings even though the daily volumes are small, would be very large.

It is due to this large area requirement for trickling filters on some industrial wastes with very high BOD concentrations that a new method of initial BOD reduction has been developed. This method may produce an effluent with BOD that may be treated by trickling filters of a reasonable size. This method utilizes anaerobic digestion units as the first phase of treatment; the entire volume of raw wastes is pumped daily into the digestion tanks, and the overflow from the digestion tanks, equal to the daily volume of wastes, (which, in a normal sewage treatment plant, would be termed the supernatant) becomes the total influent volume to the trickling filters. For some wastes of this character, this method of treatment has reduced BOD from 70 to 80 percent, in the pre-digestion step alone. This results in an influent to the trickling filters of reasonable concentration, permitting filters of moderate sizes.

If, for instance, a waste with a BOD concentration of 30,000 ppm, a low suspended solids content, and low volume is handled in this way, the pre-digestion units need not be large. Assume a BOD of 30,000 ppm and a total daily flow of 25,000 gallons. The total raw BOD is 6555 pounds per day. A pre-digestion system with a total volume equal to 6 days raw waste flow (150,000 gallons, or 20,000 cu. ft.) may reduce BOD 75 percent, and the total remaining for the trickling filters to handle is only 1639 pounds per day. This may be treated on trickling filters of either the low rate or high rate type.

The generally higher concentrations of BOD in the average indus-

trial waste and the frequent need for conservation of space for industrial waste treatment plants may influence the choice of filter types. Without prejudice for one type of filter over another, it may be conceded that the high rate trickling filter offers advantages in the treatment of industrial wastes, due to lesser space requirements and often lower cost.

Table 1—Examples of BOD Concentration of Wastes

Type of Waste	BOD Ppm
***Cannery* (vegetable)**	
Beets, red	7,000
Corn	625 to 8,400
Peas	1,490
Squash	10,800
Tomatoes	848
Sauerkraut	2,000 to 2,400
Citrus fruits	100,000
Dairy Wastes	
Whole milk	102,500
Skim milk	73,000
Whey	32,000
Buttermilk	64,000
Evaporated milk plant	560 to 2,880
Beet Sugar	
Steffens waste	54,000
Fermentation Industries	
Brewery beer slop	11,500
Distilling grain, whiskey	685 to 34,000
Distilling alcohol from cane molasses	30,000 to 33,000
Distilling butyl alchohol	10,800
Slaughterhouse and Meat Packing Wastes	2,200 to 9,100
Fowl Packing Wastes	300 to 7,500
Textile	
Cotton desizing	1,750
Cotton printing and finishing	280
Kier wastes	1,240
Dye wastes (sulphur)	1,300
Silk	1,720
Wool scouring	1,200
Rayon (viscose)	300
Pharmaceutical Wastes	
Penicillin	13,000
Streptomycin	2,500
Chewing Gum Manufacturing Wastes	1,500 to 2,000
Pickle Factory Wastes	2,000 to 2,400

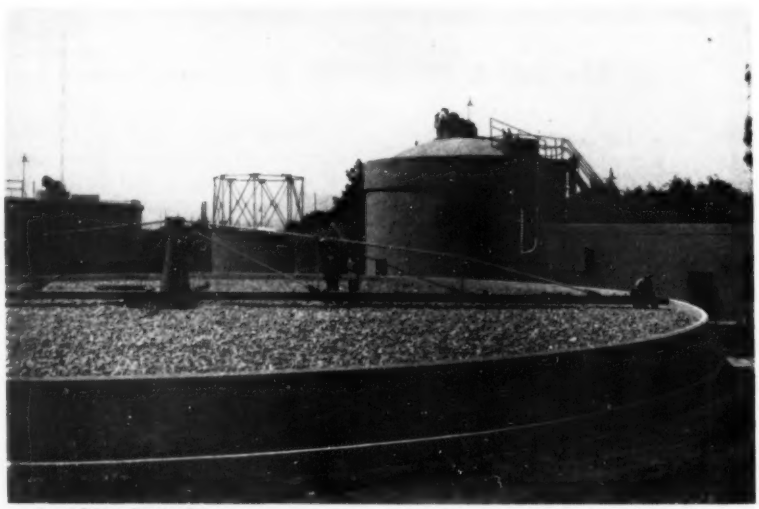
The High Rate Filter

The high rate filter is able to reduce BOD at loadings which are much in excess of those formerly considered practical, and the higher the initial BOD concentration, the greater the loading factor per unit of bed volume or area may be. Also, as the BOD concentration increases, better results from the standpoint of percentage of reduction are obtained by increasing the ratio of recirculation. The volume of recirculated filter effluent has no effect on the size of the filter itself but principally affects the design of the distributor unit which must have center column openings and distributing arms and orifices of sufficient size to handle the maximum flow of raw waste plus the volume of recirculated effluent. Distributors are normally designed to handle a maximum flow consisting of the peak flow of raw waste plus the total recirculation, and a minimum flow of the recirculation volume alone, with no inflow of raw waste.

If the flows from industrial plants were very large, the high rates of recirculation used would create a pumping problem. Fortunately the waste flows from the average industrial plant are usually relatively small so that the increased recirculation rates used do not require the use of large capacity pumps or result in high power demands.

For instance, if the waste flow is 100,000 gpd and it has been determined that two-stage high rate filtration will produce a satisfactory reduction in BOD when the rate of recirculation in each stage of filtration is 3 times the volume of raw waste, recirculation will be 300,000 gpd in each stage. For this, in each stage, a centrifugal pump will be required with a capacity of 208 gpm against a total head of 15 feet. This may be obtained with a 3-inch pump, requiring a 1½-hp motor. As these pumps run continuously, the total daily usage of electrical power with the two pumps in operation will be only 54.0 kwh.

To cite a concrete example: The wastes from the production of alcohol from sugar cane molasses have BOD concentrations ranging from 22,000 to 33,000 ppm. It is common practice, when treating the effluent from the pre-digestion step used in handling these wastes, to use recirculation rates of 5 to 7 times the volume of digester effluent. Even in a large distillery of this type, a waste flow of 225,000 gpd is about the upper limit, so that with a two-stage plant, using 3.5 times recirculation in each stage, the pump size for each phase will be 547 gpm and the pump will require only 3 hp to operate it. This does not create an inordinate expense in operation.



● **BOTH SEWAGE and cannery wastes are treated at the Palo Alto plant.**

To illustrate the necessity for studying carefully the area difference between the low rate and high rate filters, we may consider further the above alcohol distillery wastes. In one particular case for which a plant has been designed, the raw wastes from the distillery have a BOD of 22,000 ppm. The total daily volume of waste liquor is 18,600 gpd. The total amount of BOD to be handled is 3412.73 pounds per day. At a normal loading rate of 400 pounds per acre-foot on low rate filters, this requires 8.53 ac. ft. of media; and with a 6-ft. deep, a surface area of 1.422 acres. With the same flow and BOD, the high rate filter, with two-stage operation, recirculation of 3 times raw flow in each stage, and with a loading of 5 pounds of BOD per cubic yard of media, would require two filters,

each 3 feet deep and each with an area of 3073 square feet, or 63 feet in diameter. This gives no reduction credit to the primary sedimentation unit, but on these high BOD, low suspended solids wastes, the reduction by primary sedimentation is only about ten percent.

However, even when using the high rate filter on this waste, the filters are still on the large size for such a small volume of raw flow; therefore, it has been found satisfactory and economically practical to employ pre-digestion ahead of the filters. On wastes of this type, it has been demonstrated that pre-digestion of the entire waste flow for a period of 6 to 9 days will reduce the BOD from 75 to 80 percent, thus resulting in substantial economies in the size and operation of the filters.

With the example above as a definite case, the initial BOD total load is 3412.73 pounds per day. Adopting pre-digestion units with a capacity of about 14,880 cubic feet, and assuming a reduction of only 75 percent of the BOD is obtained, there remains only 1023.83 pounds of BOD per day. Using the same loading and depth of filters, we find that we now will need two filters having a total volume of 204.7 cubic yards. This resolves into two units each 35 feet in diameter.

Using the recirculation ratio of three times the raw waste volume in each stage, the total amount to be recirculated in each stage will be 55,800 gpd or 39 gpm. This may be handled by a 3-inch pump requiring only ¾ hp, and the total daily power demand will be 27 kwh. These are quite conservative design figures. In one test on distillery wastes from grain alcohol, recirculation ratios of up to 32 times the raw waste volume were employed with BOD loadings of 9.16 pounds per cubic yard of filter. Satisfactory results were obtained.

Flowsheet No. 1 illustrates the layout of a plant utilizing this method of treatment. This same general treatment has been applied successfully to wastes from canning operations, the manufacture of yeast and malt syrup, distillery wastes from grain distilleries, beer slops from breweries, etc.

Specific Examples of Treatment of Industrial Wastes on Trickling Filters

Cannery Wastes: Trickling filters are considered most satisfactory for these wastes because the BOD in the wastes is exerted rapidly due to the high sugar content and its rapid decomposition. Also, trickling filters will readily handle loads of extremely high concentrations of wastes. For wastes averaging around 1000 ppm BOD and for pre-treatment, loadings of 5 to 6 pounds of BOD per cubic yard of filter may be used. Tests on corn cannery wastes have indicated that loadings as high as 22 pounds per cubic yard may be used on the primary high rate filters, when preceded by sedimentation. With such loadings, reductions of approximately 50 percent of the BOD have been achieved, with the raw wastes having an average BOD of 8400 ppm.

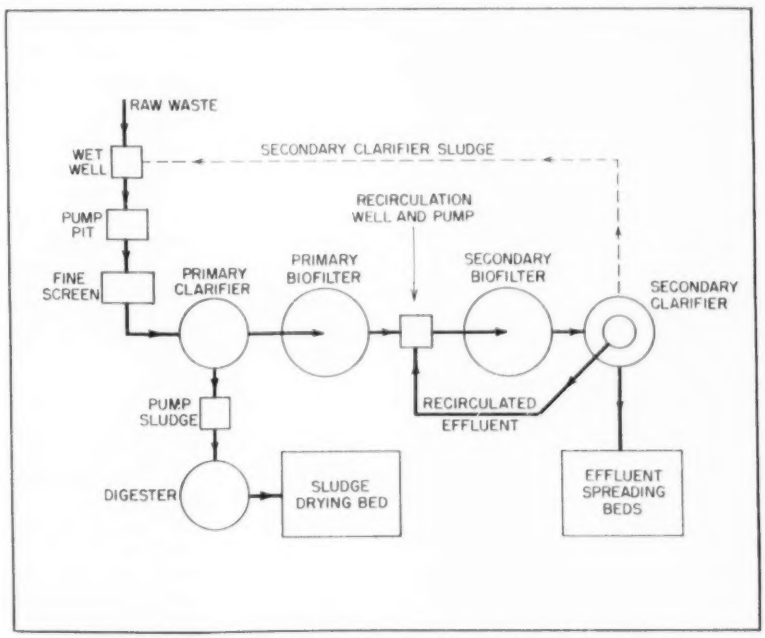
At Albion, New York, pea, green bean and tomato wastes have been treated on standard high-rate filters with BOD reductions up to 97 percent.

Sauerkraut packing wastes have been treated on filters using blast furnace slag as the medium. In the test period, raw waste loadings on the filters ranged from 575 to 6800 pounds BOD per acre-foot per 9-hour day. The dosing rates ranged from 9 to 30 mgad, and the rates of recirculation from 3.3 to 19. The characteristics of the raw wastes were pH 4.0; acidity 1100 ppm as $CaCo_3$; chlorides 4500 to 6500 ppm.; total solids 12,000 to 13,000 ppm.; BOD 2000 to 2400 ppm. The filter used in the pilot plant was 10 feet in diameter and 6 feet deep with slag media. With adjustment of the pH of the wastes to a minimum of 6.6, a BOD reduction of 85 percent was obtained. Concentrations of chlorides up to 5000 to 6000 ppm seemed to have little effect on the biological efficiency of the filter. There was no evident relation between the ratio of recirculation and the reduction in BOD.

Citrus fruit cannery wastes frequently were found to have BOD concentrations as high as 100,000 ppm. Reduction of BOD on trickling filters was obtained after preliminary treatment by screening, coagulation with chemical reagents, such as alum and lime, and dilution with cooling waters.

Dairy Wastes: These comprise the waste waters from creameries, where milk is separated; bottling plants; milk condensing plants; powdered milk plants; and cheese, butter, ice cream and other milk products plants.

The BOD ranges from approximately 100,000 ppm for whole milk wastes to 30,000 ppm for whey. The wastes respond definitely to treatment on trickling filters after preliminary treatment to remove coarse solids. In treatment, it is common practice to include a step of aeration



● **FLOWSHEET No. 2, layout of plant for treating brewery wastes.**

to inhibit anaerobic action during the retention period and, of course, this step also aids in BOD reduction. The screened and aerated wastes are applied to either low rate filters, especially in small plants, or to high rate filters with recirculation, from a batch holding tank. Filter loading is 1.0 pound of BOD per cubic yard. Reductions of 90 to 95 percent of the BOD have been obtained.

Single-stage recirculating type high rate filters are satisfactory where a final effluent with 70 to 100 ppm BOD is acceptable. With two-stage high rate filters operating in series, with recirculation in each stage, reductions of 90 to 95 percent have been obtained, with primary BOD loadings of 1.5 to 2.0 pounds per cubic yard and secondary filter loadings of 0.75 pound per cubic yard.

The following installations utilizing trickling filters for dairy wastes have been reported:

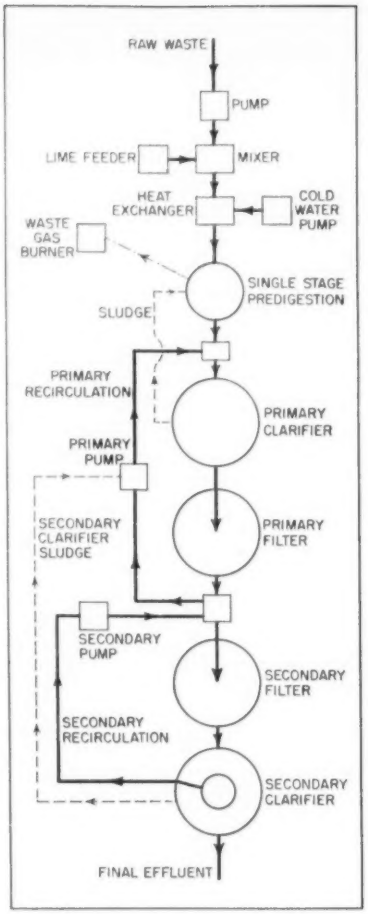
Perrinto, Mich., uses high-rate filters, 36 ft. in diam. and 6 feet deep, with recirculation to give 90 percent BOD reduction.

Pet Milk Co., Coldwater, Ohio, has a raw waste averaging 1290 ppm BOD. After sedimentation, the effluent is diluted with pan water and applied to filters. Overall BOD reduction of 98.3 percent is obtained. The filter is 87 ft. in diam., with an 8-ft. depth of slag. Filter effluents varied from 5 to 54 ppm BOD, with an overall average of 25 ppm. Recirculation ratio is 5 to 1.

Central Kansas Cooperative Creamery Association, Hillsboro, Kansas, uses a primary filter loading stated to be 4.4 pounds of BOD per cubic yard and a secondary filter loading of 1.2 pounds.

The Water Pollution Board of England found that double filtration is satisfactory treatment for milk and whey washings. Double filters with periodic alternation in the order of filtration are used. After settling and dilution, the wastes with a BOD of 200 to 300 ppm were applied to alternating trickling filters at the rate of 192 gallons per cubic yard per day. Milk washings alone could be applied at a rate of 288 gallons per cubic yard per day.

Beet Sugar Factory Wastes: Trickling filters have been found satisfactory as the final steps in the treatment of flume water, press pulp and diluted Steffens House wastes. Preliminary treatment is essential, consisting of screening; removal of dirt and grit, from the beets; and sedimentation. The operating period of beet sugar factories is very short, usually only two or three months, and as the trickling filter may require a ripening period of 4 to 6 weeks, it is not yet commonly employed on these wastes.



● **FLOWSHEET No. 1 illustrates use of recirculation in treatment of industrial wastes. See page 77 also for reference to its use.**

Fermentation Industry Wastes: This class comprises the wastes from breweries; distilleries for the production of whiskey, brandy and alcohol; and the production of alcohol from sugar cane molasses. These wastes are normally high in BOD and low in suspended solids, with high total solids content and low pH. For wastes with very high BOD, it has been found best to employ the method shown in Flowsheet No. 1, using a stage of pre-digestion ahead of the trickling filters.

At the Lucky Lager Brewing Company plant in California, the waste treated had a BOD of 445 ppm. Total average daily volume is 335,000 gpd and total daily BOD 1242 pounds. The treatment plant developed (See Flowsheet No. 2) consisted of a fine screen, primary mechanically cleaned settling tanks, and two high rate trickling filters, operating with recirculation on the Biofilter plan. Each filter is 60 ft. in diameter and 3 feet deep. The planned BOD loading was 1.66 pounds per cubic yard of media. The recirculation ratio provided is 2.5 times the influent volume. Following the filters, sludge digestion, sludge drying beds and final effluent percolating beds completed the layout. The total reduction of BOD reported averages 88 percent. The satisfactory operating results indicate that this type of biological treatment is admirably suited for such waste.

The Gulf Brewing Co., Houston, Texas, uses a similar type of plant with preliminary settling and two trickling filters, each 100 ft. in diameter and 6.5 feet deep. The filters are operated in series. Reported overall efficiency of this plant is 83.7 percent removal of suspended solids and 96.5 percent reduction of BOD.

Distillery Wastes: Monticello Distillery, Cedarhurst, Md., operates a high rate filter plant. The design loading is 0.75 pound of BOD per cubic yard. Dosage rate is 8.0 mgad with recirculation ratio of 4 times raw waste volume. BOD reduction of 99.9 percent is expected from this plant.

At Seagram & Sons, the raw waste averaged 685 ppm BOD; the high-rate filter loading is 1.1 pound per cubic yard and the dosage rate is 30.0 mgad. A recirculation ratio of 11 to 1 produced an over-all BOD reduction of 77 percent.

At another installation, a high-rate filter with a dosing rate of 2.0 pounds per cubic yard, or 3200 pounds per acre-foot, produced a BOD reduction of 50 to 70 percent.

At Schenley Distilleries, Cincinnati, O., a trickling filter readily handles leftover wastes with an average BOD of 550 ppm at a temperature of 114°F. This high-rate filter removes about 93 percent of the BOD, changes pH to 7.5 from 5.0, and lowers the temperature to about 75°F. Recirculation ratio used is 4 to 1.

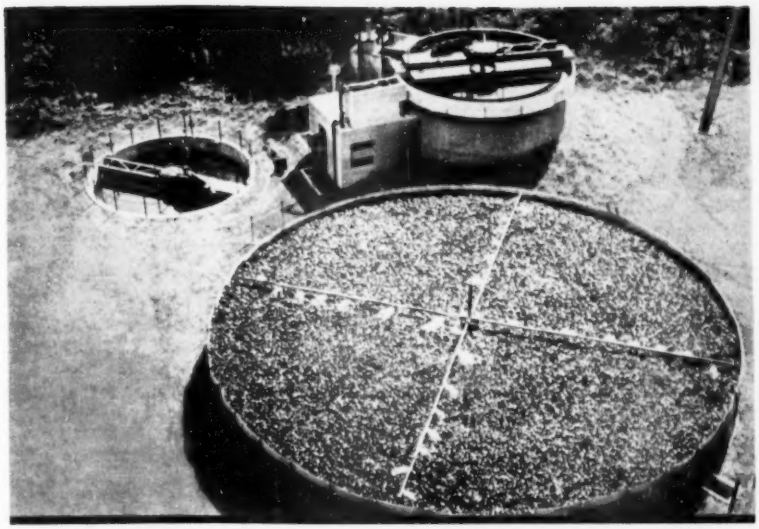
At another installation treating distillery slop, high-rate filters followed a digestion step. The raw waste BOD was reported as 15,000 ppm. This was reduced to 1500 to 2000 ppm by digestion. The digester effluent was applied to the filters at the rate of 250,000 gpad.

Yeast Factory Wastes: Experiments on these wastes by Dr. Willem Ru-

dolfs and E. H. Trubnick at Rutgers University, included predigestion, sedimentation and the application of digester effluent to trickling filters operated in series with recirculation. It was reported that, regardless of the nature of the wastes applied to the filters, the reduction of 50 percent of the applied BOD remained fairly constant. It was found that loadings up to 11,000 to 12,000 pounds of BOD per acre-foot per day could be applied to the filters without material deterioration of efficiency.

Slaughterhouse and Meat Packing Wastes: This classification includes the wastes from slaughterhouses and abbatoirs, as well as the wastes produced in the preparation of meat and meat products for the market. These wastes vary widely in BOD concentration, ranging from 2200 to as high as 9100 ppm. In several large plants treatment on trickling filters has been employed satisfactorily when preceded by screens, sedimentation and means for removing grease. Sedimentation alone reduces the BOD as much as 30 to 35 percent. Low rate filters may remove up to 80 percent of the remaining BOD. In several cases two-stage filtration, with the primary filter so constructed that it may be washed, followed by sedimentation and a second step of filtration has been used with an overall plant reduction of 94 percent of the BOD. This practice was employed at Mason City, Iowa, and the effluent was found to be well nitrified.

At the Armour Co., West Fargo, N. D., plant provisions are available for two or three-stage high rate filtration. The primary filters are arranged for air and water washing and are operated at loadings of 5000 to 6000 pounds of BOD per acre-foot per day. With raw waste BOD averaging 1000 ppm, a reduction of 95 percent has been obtained in the plant.



● **PLANT OF Schenley Distilleries at Cedarhurst, Md., treats about 100,000 gpd of process equipment water and sewage on high rate filters.**

Eldridge reports successful use of trickling filters on such wastes, with preliminary treatment by septic tank. Filter loading of 0.65 pound per cubic yard with recirculation of 4.7 to 1 produced an overall BOD reduction of 98 percent.

In another instance, a low-rate filter operating at a loading of 2.0 pounds per cubic yard produced a BOD reduction of 82 percent. Raw waste flow was small, 30 gpm. The filter was reported to pond badly if overloaded or if grease was not previously removed.

Klassen and Hasfurther have reported that chemically treated packing house wastes have been successfully treated by the Aerofilters. With a BOD loading of 4050 pounds per acre-foot, the average overall plant reduction was 94.5 percent.

Fowl Packing Plant Wastes: These wastes, while normally classed as industrial wastes, also contain defecated material from the fowls, which tends to put them in the class of sewage. The BOD range is high, from 300 to 7500 ppm. With sedimentation as a primary step, trickling filters will produce a satisfactory effluent.

Textile Wastes: These include wastes from the processing of cotton, wool, silk, rayon and other synthetic fibers, including wool washing and dyeing, cotton finishing and printing.

Cotton finishing wastes are treated at the Sayles Finishing Plants, Saylesville, R. I. The plant has two high rate filters, each 83 feet diameter with 6 feet of stone, treating a total daily volume of 3.3 mgd. The raw BOD is 200 ppm. The filters are designed for a loading of 2.0 pounds per cubic yard with 2 to 1 recirculation rate.

Coburn reports that, with a pilot plant on cotton printing and finishing wastes, with equalization of flow and chemical precipitation followed by high rate filters with recirculation, a reduction of 60 percent of the BOD was obtained with an application rate of 14.0 mgad of the wastes.

Experiments on de-greased wool scouring wastes have shown that these may be treated on trickling filters to obtain any desired degree

(*Continued on page* 109)

● **COMPACT treatment plant handles wastes from a packing plant.**

Testing Procedures to Locate Leaks in Storm Sewers

IN University Heights, O., leaks in storm sewers caused flooded basements. To make repairs, it was necessary to locate the leaks as the cost of digging up much of the storm sewer system would have been prohibitive. After a year of experimentation, a method for locating the leaks was devised. This was described in Clay, publication of the Clay Sewer Pipe Association, by H. P. Peterson, City Engineer.

Step 1 in the procedure for locating the leak between any two manholes consisted of passing a rope through the sewer. In Step 2, the rope was pulled back, bringing with it a capped air hose and a length of cable. The air hose and cable were attached to an air bag, and a fire hose connected to a water bag, at a predetermined distance apart, Step 3. A third of a cup of permanganate was added into the fire hose to color the water. Step 4 consisted of inserting the bags into the sewer and stopping them at the predetermined location for the leakage test. The air bag was then inflated, Step 5, to a pressure of 5 to 10 lbs. and the fire hose was opened to fill the sewer between the two bags. As Step 6, a man at the house test tees listened for leaks; another man checked any sudden increase in the flow in the sanitary sewer, which is directly beneath the storm sewer.

In a period of 19 months, 750 leaks were located, excavated and repaired. Practically all of these were at the points where house storm sewers joined the main sewer. Generally one trunk sewer line is completed before another is started. Costs have averaged about $100 per repair. It is possible to repair about three wyes per day, using about 34 manhours. Eugene Russu is assistant city engineer.

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Chemical Baits for Insecticide-Resistant Flies

Chemical baits may be the answer to the control of insecticide-resistant house flies, according to entomologists of the Department of Agriculture. A "chemical bait" is a combination of an insecticide with something like molasses, which is attractive to flies. Used in recent experiments at the Orlando, Fla., laboratory of the USDA Bureau of Entomology and Plant Quarantine, such baits proved more effective against resistant flies than any other treatment tried during the past three years. TEPP, sodium fluoro acetate, sodium arsenate and sodium arsenite were the toxic chemicals used in the test work.

Although considered highly promising by the entomologists, the Department emphasizes that this method is not yet being recommended for general use in resistant fly control. All the chemicals are highly toxic to both man and animals and further investigations concerned with their safe use must be made.

The combination of these insecticides with blackstrap molasses or brewers' malt gave good control in field tests in a number of Florida dairies. Chemical baits of sodium arsenate, water, and blackstrap molasses or malt, were set in pans in several dairies. In others, floors of the dairy barns were sprinkled with solutions of TEPP, blackstrap molasses and water. The pan method provided a higher degree of control over a much longer period of time and required fewer applications. Equipment required for either type of treatment is cheap, easy to get, and needs very little maintenance.

Planning the Pasco Bridge

GUY BROWNING ARTHUR

PLANNING a bridge can be a routine job when the governing factors stay in place—when the population increase behaves normally, the traffic counts are safe guides, and the rise and fall of the stream are well plotted. But when all these normally sober factors hang on sky-hooks and swing with the breeze the job is different. For the Pasco Bridge these factors seem to be on a binge. Therefore this job across the Columbia River in Eastern Washington takes on unusual interest.

The Columbia River is the most important stream in the country for potential water power and for other reasons. It generates power and provides water for irrigation at Grand Coulee. Then it receives more water from such streams as the Yakima and Snake rivers. The potential in these streams is extremely high, and their full development is planned for continuous construction through many years ahead.

One of the dams already in progress is the McNary, just below the Oregon state line. Until this dam is finished the river will flood in the summer and recede to low ebb in the winter, a peculiarity of streams in this area. After the completion of McNary Dam the water will back up to a controlled stage reaching above Pasco and Kennewick, which stands on opposite sides of the river.

Way back in the pre-development era the Tri-Cities of Pasco, Kennewick and Richland had a combined population of about 6,000. Pasco existed as a division point on the Northern Pacific Railroad, Kennewick was a trading town for sparsely settled ranch country, and Richland was a scarcely perceptible dot on the map. This is desert country, with six or seven inches of rainfall. Late in 1942 the U. S. Army Engineers were looking for a site for making plutonium. They chose 631 acres of land in Benton County, Washington, north of the big loop of the Columbia River. The specifications were: sparse population; plenty of cold, pure water; and unlimited electrical power.

That set off a wildcat boom; conditions ran wild. One development and expansion followed another. The first plant was completed in 1944, and the "temporary" population moved out. During construction the "population" had peaked at 51,000, 8½ times the former population.

In 1946 there was a change in prime contractors. General Electric, Nucleonics Division, took over from E. I. duPont de Nemours, Inc. The next wave of expansion started in 1947, and this work was finished in 1949. More work was started in 1950 and is still going. The original cost of the Hanford plant was $350,000,000.

Any approach to planning a new bridge between Pasco and Kennewick is stimulated beyond measure by the overloading of the present bridge. All of the staggering traffic generated by this transformation from desert to industry is carried on a two-lane bridge with a roadway 19 ft. 4 ins. wide, built in the horse and buggy days. It is dangerously over-stressed, not only by passenger and commercial traffic, but especially by the movement of military vehicles, necessary to the defense of the Atomic Energy Plant.

Imagine the consternation of the designers of this bridge at moving a military vehicle weighing 137,000 pounds—68½ tons—across it. The structure was designed for two 20-ton trucks, and it is standing up under an overload of 70%. A serious traffic jam is created every time one of these huge vehicles crosses. It goes by special permit. Its weight, plus its width of more than 10 ft., closes the bridge to all other traffic.

In approaching the planning of the bridge it is found that none of the usual estimates can be nailed down. The possibilities in the area are too volatile. Some of the effects of present and expected developments can be reduced to workable figures. Others cannot.

The three cities of Pasco, Kennewick and Richland had altogether 6,078 people in 1940; in 1950 they had 42,145, and population is still going up. Pasco and Kennewick have increased by 420 percent; Richland boasts 8,800 percent. Each new wave

of construction means a sudden change in population, coming up and going down with characteristics not well known and never fully anticipated.

Strictly local transportation for the 9,000 employees of General Electric is a major problem. Many of them live in Richland, but a large number are buying or renting homes in Pasco and Kennewick. In addition, many hundreds of persons working for the Atcheson-Jones Construction Company, principal contractor in the Hanford Plant, live in Pasco and Kennewick because they cannot find places in Richland. Besides all these, there are the employees of the Atomic Energy Commission.

Traffic Studies

The Washington State Highway Commission began with a study of the "practical capacity" of the present bridge. This is defined as the "maximum number of vehicles that can pass a given point on a roadway during a one-hour period without the traffic being so dense as to cause unreasonable delay, hazard, or a restriction of the driver's freedom

to maneuver." It extended this with the statement: "Within urban areas where relatively low operating speeds are satisfactory and conditions are ideal, the practical capacity of a 2-lane road is 1,500 passenger cars per hour."

It found that for a 2-lane structure such as the existing Pasco bridge, where lane widths are substandard, lateral clearance is restrictive, and 17% of the traffic is made up of commercial vehicles, a flow of 1,500 vehicles per hour is far above the tolerable limits. The practical capacity of the bridge was actually half that figure, or 750 vehicles per hour. The survey showed that between 10:00 AM and 9:00 PM some 2,495 vehicles crossed the bridge in excess of that capacity.

Here a new element was introduced. Naturally many drivers would prefer to use the new 4-lane bridge and avoid the old congested crossing. But would they pay for the privilege? Since there is no gain in distance, the probabilities were based on the time saved. Any gain in time in un-stopped travel had to be offset by the time lost in paying tolls. It was estimated that because of the wider lanes and shoulders, and the controlled access, the travel time across the new bridge would be half that over the old one. Using a factor of two cents per vehicle-minute, an economic benefit of 12 cents could be placed on the time saved for each user.

An extraordinary amount of conjecture developed about the probable use of the new bridge if tolls were charged. Just why, it is hard to see, when toll operation has been so successful elsewhere for both bridges and highways. It was said in the studies that the expected extent of use of the new bridge, as a free structure, "can be determined with reasonable accuracy. The popularity of a toll crossing is infinitely more difficult to determine, both upon its completion and in future years."

Further, after analyzing the estimate figures, it was said that on the basis of equal time-cost to drivers it would appear that half of them would use the old bridge and half the new one. Actual experience will prove this estimate so wrong as to throw it out of court, if the history of well-planned toll structures generally is accepted. But the conclusion was that only 30% of the drivers will pay toll for a faster and freer crossing.

The forecast for future use of the bridge is so cautious as to cause considerable wonder. It says the activities of the Atomic Energy Commission, the completion of proposed dams on the Columbia and Snake rivers, and the steady development of the Columbia Basin, will have a profound effect on the growth of the surrounding country and the increase in vehicular travel. Then it continues with a statement that when the "temporary" elements are removed, the 1970 traffic over the existing bridge will be 10,985 vehicles, and 11,769 over the new one. But if a toll is charged the new bridge will receive only 8,775 vehicles in 1970.

The purport of this is that fewer vehicles will use the new bridge in 1970, even if it is free, than the estimate of 12,540 for 1951. Such an estimate puts a high value on the numerical pressure of the "temporary" population — consisting chiefly of construction forces, and exhibits a strange view of the effect of new activity in the area.

Without doubt the permanent operating force at the Hanford project will be smaller than the present boom population, but that is only one factor, and an internal factor. In such a place external factors will govern the traffic flow, including tourists.

Design of the Bridge

The total length between pavement seats is 2521 feet—nearly half a mile. The bridge proper is 1170 ft. long, made up of continuous tied-arch steel spans resting on four piers. Each of the two end spans consists of 10 32.5-ft panels, while the center span has 16 panels of the same length. At the Pasco end are three steel girder spans totalling 480 ft. and at the Kennewick end there are five similar spans totalling 800 ft., with a short unattached span of 60 ft. There will be a 56-ft. roadway with 4 ft. 10-inch walls on both sides.

The center span is to be 49½ ft. above the 1894 backwater stage at elevation 352.3. Normal pool elevation will be 340 when the McNary Dam is completed. A low water level is recorded at 318.4.

Contracts and Construction

Three contracts for the substructure were let in August, 1951 to Paul Jarvis, Inc., Robert W. Austin, both of Seattle, and Cascade Contractors, Inc., of Pasco. It was expected that the cofferdams would be completed in the fall months of that year and early spring of 1952. Delays in the delivery of steel plagued the job, and the building of piers 7 to 10 had to be postponed temporarily.

Some of the piers rest on cemented gravel and boulders far below the bed of the river. The upper layer is so hard that it was a tough problem for the contractors. Eventually they devised a pointed steel breaker shaped like a large axle. This was raised to a height of 20 to 30 feet and dropped. It broke the material so that a clam shell could pick up the pieces.

Concrete for the piers is mixed in a central plant built by the contractors on state-owned land on the Pasco side. Aggregates are taken from a state-owned pit, and trucked to the mixing plant. Bulk cement is hauled by trucks and stored in a modern steel silo. The mixed concrete goes to the job in transit-mixing trucks.

All planning and designing were done by the State Highway Commission, of which William A. Bugge is Director. The bridge design was developed by George Stevens, Bridge Engineer. The Resident Engineer at Pasco is W. F. Hennager.

MANY STATES MAY BAR FEEDING RAW GARBAGE TO SWINE

APWA and Am. Mun. Assn. Survey Effect on Present Disposal Practices

Recent nation-wide epidemic of vesicular exanthema, a swine disease attributed to their being fed raw garbage has aroused considerable interest in the adoption of state laws or regulations prohibiting the feeding of raw garbage to swine. Illinois and Nebraska are two states that have recently taken such action. Seven other states including Washington, New York, Oregon, Wyoming, Florida, Kentucky and Georgia previously adopted such prohibitions. The Illinois regulation provides that garbage must be heated to a temperature of 212 degrees Fahrenheit for 30 minutes, if it is to be fed to swine.

Between 15 and 20 other States are reported to be preparing such legislation for consideration in the

(*Turn to page* 84)

How to Get More Complete Data

Each month special news items are included in this column to acquaint our readers with the activities and nature of services rendered by the APWA. Supplemental information concerning items appearing in this column is presented in the Association's Newsletter. Applications for membership should be addressed to the Executive Director, 1313 East 60th Street, Chicago 37, Illinois.

APWA -AGC Joint Cooperative Committee Meets to Discuss Uniform Contract Conditions

The first meeting of the Joint Cooperative Committee of the American Public Works Association and the Associated General Contractors of America was held at the Drake Hotel in Chicago, January 28. C. R. Ralph, of the Kaw Paving Company, Inc., Topeka, Kansas presided over this initial meeting. APWA President, Allan H. Rogers of Garden City, New York and Arthur S. Horner, Denver, President of the AGC were in attendance. The Committee discussed the desirability of preparing a set of uniform "general conditions" for contracts. They also considered the importance of adequate inspection and cost records and other subjects of mutual interest.

Mr. Horner said, in commenting on the meeting: "I was particularly impressed with the open-minded manner of the public works officials present and their receptiveness and understanding of the contractor's problems. This approach to matters of mutual concern cannot help but result in more harmonious relationships between municipalities and contractors and in better and more economical use of the taxpayer's money."

The next meeting of the committee was tentatively set for September 11, 1953 in Chicago.

● **LEFT TO RIGHT:** front row—J. M. Sprouse, *Washington, D. C.*; Milton Rosen, *St. Paul, Minn.*; George Thompson, *Detroit, Mich.*; C. R. Ralph, *Topeka, Kans.*; Allan Rogers, *Garden City, N. Y.*; Arthur Horner, *Denver, Colo.* Back row—Milton Offner, *Los Angeles, Calif.*; Lyall Pardee, *Los Angeles, Calif.*; J. A. Thompson, *Los Angeles, Calif.*; D. F. Herrick, *Chicago, Ill.*; F. S. Oldt, *Dallas, Texas*; R. M. Dixon, *Dallas, Texas*; Roy F. O'Mara, *Pittsburgh, Pa.*; Robert D. Bugher, *Chicago, Ill.*

very near future. It is expected that many municipalities will turn to different methods of garbage disposal if this type of legislation is adopted by most states throughout the country. The APWA and the American Municipal Association are conducting a survey to ascertain what action municipalities are taking when faced with the problem of changing their present practice of feeding raw garbage to swine or permitting their contractors to dispose of garbage in this manner.

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1954 APWA CONGRESS MEETS IN NEW ORLEANS OCT. 26th THROUGH 29th

THE 59th Annual Public Works Congress and Equipment Show will be held in New Orleans Monday October, 26 through October 29th at the Municipal Auditorium. Plans are now being made to insure another outstanding Congress which is expected to attract over one thousand persons from all parts of the country.

The Proceedings of last year's Congress, held in Los Angeles are now available upon request to members. Excellent papers on the following subjects are included in this regular publication of the APWA.

ACTION ON THE POLLUTION ABATEMENT FRONT — Federal program of action; interstate developments; state activities.

SUBDIVISION CONTROLS—Improvement financing; improvement standards; planning integration.

IMPROVING EMPLOYEE PERFORMANCE — Administrative training; training the supervisor; employee training.

PUBLIC WORKS FINANCING—Service charges; special assessments; general tax levies; borrowed funds.

The informative paper—Cities' Interest In Water Resources, by Samuel B. Morris, General Manager of the Los Angeles Department of Water and Power—is also included in the 1952 Proceedings which is available to non-members at the price of $5.00 per copy.

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Special APWA Report

A new formula for determining the burning capacity of incinerating plants has been prepared by A. Janssens, Director of Public Cleaning Department, Antwerp, Belgium and a Consulting Engineer, R. Standaert from Brussels, Belgium.

Details of the formula are included in a Special Report: "Precalculation of The Annual Tonnage That A Refuse-Incinerating Plant Can Burn," which is available to members, upon request. After applying the formula to plants operating in Great Britain, Sweden, France and Switzerland the author states that the results "prove clearly that . . . (the) formula can be put into practice in all cases in order to determine the annual tonnage that the refuse disposal plant can burn". The report has previously been published in different languages throughout Europe.

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APWA–PHS Prepare Manual on Sanitary Refuse Practices

The APWA is cooperating with the Public Health Service of the Federal Security Agency in preparing a bulletin "Refuse Storage, Collection and Disposal System For The Small Community." The preliminary draft of this bulletin has been prepared and is now being reviewed by a special committee, headed by W. A. Xanten, Supt., Division of Sanitation, Washington, D. C.

This is being prepared primarily for use in communities below 5,000 population. Surveys have shown that many small communities do not employ sanitary refuse practices. Predominate among the basic causes of this situation is a general lack of knowledge on how to set up and operate a satisfactory system, and the belief that adequate service is too expensive. This bulletin is designed to help overcome these obstacles. It includes a discussion of certain factors which need to be considered in establishing sanitary refuse practices and also presents representative operational and cost data in such a manner that it may easily be interpreted to meet local conditions. It is expected that this bulletin will be published and available for general distribution within the next two or three months.

Otto A. McCoy, Waste Disposal Supt., Fort Worth, Texas, observed these tests as a representative of the Association.. The first draft of Part I of this manual is entitled—*Preparation of Refuse for Collection.*

PW Film Catalog Now Ready for You

Hundreds of excellent films are listed in the Association's catalog of Public Works films. These deal with all phases of public works operations including refuse collection, sanitary landfill, sewage treatment, snow and ice control, water supply, vehicle maintenance, etc.

The title, type, and length of films are listed, as well as the source from which the films can be borrowed, rented or purchased. One of the most recent additions to the catalog is a new film entitled "Sparkling Clean Streets" which was produced by the Wayne Manufacturing Company. Some of the many films listed are:

MY FATHER'S A GARBAGE MAN (1949).—*35mm; filmstrip; 48 frames.* Available from: Encyclopedia Britannica Film Library, 207 South Green Street, Chicago, Illinois, or branches in New York, Boston, Atlanta, Dallas, Pasadena, and Birmingham, Michigan.

SANITARY LANDFILLS. — *16mm; color; 17 minutes. For purchase only.* Castle Films, 1445 Park Avenue, New York 29, New York. Purchase price, $82.13. *To Borrow*: try your state or local Department of Health.

MODERN METHODS OF SEWAGE AND WASTE TREATMENT. —(1951). *16mm; color; sound; 30 minutes.* Available on loan from: Infilco Inc, Box 5033. Tucson, Arizona.

SNOW FIGHTERS.—*16mm; color; sound; 10 minutes.* Available on loan from: International Harvester Company, Consumer Relations Department, 180 North Michigan Avenue, Chicago 1, Illinois.

WATER — SPECIAL DELIVERY.—*16mm; sound; color; 28 minutes.* Available on loan from: Elgin Water Department, City Hall, Elgin, Illinois, Loan: free.

INTRODUCTION OF PREVENTIVE MAINTENANCE. — (1945). *16mm; sound; black and white; 13 minutes; also 35mm slidefilm. For purchase*: Castle Films, 1445 Park Avenue, New York, N. Y. Price $22.88. (Filmstrip $1). *To borrow*: Indiana University Audio Visual Center, Bloomington, Indiana. Rent: $1.50 (motion picture only.)

THE TRUCK AND THE DRIVER. —*16mm; sound; 10 minutes.* Available on loan: National Safety Council, 20 North Wacker Drive, Chicago, Illinois. Rental: $3.

The Wholesaler and Industry News

Like the general store of a generation ago, the wholesaler's establishment exists as a meeting place for people actually in the installation trade. Here, they compare notes and talk out problems common to all of them.

A wholesaler ranks tops as a news source. Because of his frequent contacts with manufacturers, he can often tell his customers about products that are in the planning stage. Too, many manufacturers work closely with the wholesaler in introducing new products.

Sure! Many times the system works in reverse. Wholesalers channel to the manufacturers stories as to how the product succeeded, or as to its limitations. Many manufacturers have discovered new uses for their products through this exchange of ideas.

Probably the most important way a wholesaler supplies industry news is his ability to suggest short-cuts and new wrinkles to help cut the costs of jobs. Most wholesalers have well-thumbed libraries of "how to" books and manufacturer's technical literature.

Your wholesaler probably has copies of Wolverine Tube's PLUMBER'S PAL and TUBE TRAILS. Ask him for one, today.

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BUY FROM YOUR WHOLESALER

Leo Ritter

(*Continued from page* 14)

Kandiyohi County Engineer at Wilmar, Minnesota, presented a paper "The Minnesota County Highway Engineers Institute—an Experiment in Extension Programs" at the recent Highway Research Board meeting. This institute, which Mr. Ward says is still in the experimental stage, is an annual four-day seminar sponsored by the Minnesota County Highway Engineers Association to keep county engineers informed of the latest developments in highway administration. It is a part of the extension program of the University of Minnesota. Mr. Ward's paper is abstracted in the January 19 issue of "Local Roads" published by the County and Local Roads Division of the American Road Builders' Association, Washington, D. C. If you are interested in details write to Ben F. Ostergren —he'll put you on the regular mailing list for "Local Roads", if you ask him to.

Another Crisis: The highway world seems to be full of crises these days, principally because of shortages. Money is short and, until recently at least, materials also. One of the most important, and one that is receiving comparatively little attention at the moment, is the shortage of men. From where I sit, naturally, the most disturbing thing about this "crisis" is the lack of interest in graduating civil engineers in making a career in public service in the highway field.

Many of the men who hold key administrative positions in our state highway departments and other large public agencies are rapidly approaching retirement age. Capable young men must be brought along to take their places. In order to receive a reasonable share of today's civil engineering graduates governmental agencies must enter into sharp competition with private industry. This spring college campuses are literally swarming with personnel people from industry armed with all sorts of inducements, including beginning salaries ranging upward from $300 per month, in-service training programs and up-to-date personnel policies.

To compete in this market in most sections of the country governmental agencies must offer more than they are offering now. One basic requirement in this battle for men is an adequate salary scale all

(*Please turn to page* 88)

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

APPROVAL of 463 water and sewerage construction projects with a total value of $124,993,948 in the fourth quarter of 1952 (Oct. 1-Dec. 31, 1952), was announced by the Department of Commerce. All of the projects were granted construction permits and received allotments of controlled materials. Of the 463 construction jobs authorized, 303 were for waterworks and 160 for sewage. Water projects are valued at $42,465,102 and sewerage construction at $82,528,846.

Government Agencies Concerned With Federal Construction

Group I engages in construction, though in widely varying degrees. Some of them establish their own criteria and do their own planning, while others depend upon related agencies in the same list for these functions. The agencies in Group II do research and prepare standards which might govern or affect not only Federal construction but considerable amounts of civilian construction.

I. DIRECT CONSTRUCTION AGENCIES

Department of the Army—Corps of Engineers.

Department of the Navy—Bureau of Yards and Docks.

General Services Administration —Public Buildings Service.

Veterans Administration — Construction, Supply and Real Estate Services.

Atomic Energy Commission—Construction and Supply Division.

Department of the Interior—Bureau of Reclamation; Bureau of Indian Affairs; National Parks Service; Bonneville Power Administration; Southwestern Power Administration; Southeastern Power Administration; Division of Territories; and Bureau of Mines.

Department of the Air Force—Directorate of Installations.

Federal Security Agency—U. S. Public Health Service; and National Institutes of Health.

Department of Agriculture—Forest Service.

Department of Commerce—Bureau of Public Roads.

Department of State—Foreign Buildings Service.

Post Office Department—Bureau of Facilities.

Department of Justice—Bureau of Prisons.

Treasury Department — Coast Guard.

Tennessee Valley Authority—Office of Engineering.

II. ADVISORY CONSTRUCTION AGENCIES

Housing and Home Finance Agency—Public Housing Administration; Federal Housing Administration; and Community Facilities Division

Department of Commerce—National Bureau of Standards; Civil Aeronautics Administration; and U. S. Weather Bureau.

Department of Agriculture—Office of Plant and Operation; Agricultural Research Administration; Rural Electrification Administration; and Soil Conservation Service.

Federal Security Agency—U. S. Public Health Service (Civilian Hospital Program); and Office of Education.

Veterans Administration — Loan Guarantee Service.

Materials Availability

Controls on construction materials have been eliminated. A few materials which are in short supply, for instance, certain alloy steels, will remain under control to the extent that supplies sufficient for national needs will be set aside. Otherwise, there are no restrictions on the use of materials for construction of any kind, and no permits or other paper work is required any longer by the Federal government.

up and down the line; this may be the most important single factor at the moment. Another requirement is a really modern personnel policy, including such things as adequate in-service training programs, a planned program of advancement based on merit alone, good working conditions, reasonable assurance against unjust dismissal or demotion, and a sound retirement program. How many state highway departments, in particular, meet these requirements at the present?—Some are doing an outstanding job but not many, that's for sure.

This crisis is with us here and now. Something concrete must be done about it or else we are going to be lacking in engineering leadership during a period of ever-increasing demand for improved highways.

Just a little side light on the main issue. How about some highway department investigating seriously the possibility of bringing in some young graduate civil engineers from foreign countries on a short-range proposition to fill partially the need for technical assistance? If this idea were properly developed I think it would find strong support in some circles in the federal government.

A. R. B. A. Meeting: Several hundred persons representing every phase of the highway industry attended the annual meeting of the American Road Builders' Association in Boston from Feb. 9 through 11. The three-day program was crowded with general and separate sessions covering both technical and non-technical subjects.

Highlights of the program for this country boy included the presentation of the George S. Bartlett award to Sam Hadden of Indiana in recognition of a lifetime spent in the cause of improved highway transportation; the address by Senator Edward Martin of Massachusetts, Chairman of the Committee on Public Works of the U. S. Senate; and the ingenious presentation of "The Case of the Strangled City" by Wilfred Owen of the Brookings Institution. Overall emphasis of the meeting was on planning and financial problems.

We had a fruitful, if long session of the Educational Division. I was particularly impressed by young Jim Spencer of Cornell who told me what that university is doing in an extension type program with Town Highway Superintendents in New York State. The Pennsylvania colleges were strongly represented this year because—others please note—they were sponsored by the Associated Pennsylvania Contractors. Got a good look at the expressway improvements which have been completed or are now underway in the Boston area—Prof. A. J. Bone of MIT squired me around. Unless I got my figures mixed up, the 1.6 miles of the Central Artery now under construction in downtown Boston will cost about $57 million.

Incidentally, the new Seaman publication mentioned earlier is now available—its title is "Stabilized Heavy Traffic Pavement."

From Here and There: Heads really rolled when the new Florida State Road board held its first meeting recently. Four assistant state highway engineer positions, together with the priorities and urban projects offices, were removed from the organization chart. • Ran into Harry Seaman of Seaman Motors, Milwaukee, Wisconsin—they manufacture that extremely handy and versatile tool, the Seaman Pulvi-Mixer—in Washington. They have another publication about ready to go to press describing the many uses of

this machine. • Over 100 highway organizations are now using radio communication systems to improve efficiency, particularly in day-to-day maintenance operations; the use of radio is invaluable in emergency situations. • There is a powerful ground swell in the making to put pressure on the Federal government to get out of the field of highway user taxation (e.g. the two-cent federal excise tax on each gallon of gasoline) and leave this field to the states.

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Florida Maintenance

(*Continued from page 67*)

mulched area is rolled with a cultipacker or a traffic roller. This tends to tighten the seed bed. It allows the seed to germinate quickly but does not destroy the sponge quality of the mulch itself.

The purpose of using the mulch is to stop erosion, which is a problem because of the heavy rains and quick runoff over our sandy and loose soils. The mulch also holds moisture during the dry seasons, permitting better seed germination and growth. Fertilizer, at the rate of 200 to 300 pounds per acre, is applied during the mulching operations and a similar quantity is usually applied after the seed has germinated or the sprigs have taken root.

We have been doing this type of work for about two years now and we have concluded that this method of protecting the slopes will result in a considerable saving on maintenance as compared to the old method of repeatedly backfilling washouts, without being able to maintain a cover crop of grass. It is believed that the cost of this mulching and seeding operation is no greater than the cost for the first six or seven months of maintenance that would normally be necessary on any new piece of road that did not have this treatment.

Roadside Mowing

In our roadside mowing work, we have made almost a 75 per cent change in the type of equipment being used for mowing as compared to five years ago. In our state we have many miles of roads that have a typical section satisfactory for the use of power mowing equipment. Because of safety reasons and because our state has many tourists coming into it, it is desirable that we keep our roadsides as clean and attractive as possible. For this rea-

son, we have done possibly more roadside mowing than have our adjoining states.

It used to be a common practice to do our mowing with 16 to 20-hp rubber-tired tractors, on which were mounted sickle bars that cut a swath 6 to 7 feet wide. With the larger units, those of the 20-hp class, it was common practice to pull a trailer mower, which also cut a 6-ft. swath. Thus, the tractor mower and the trailer mower together would cut approximately 11 ft. wide at a single trip. However, an operator was required for each machine; and it was also necessary that a foreman be available on the job. His equipment usually consisted of a 1½-ton truck carrying equipment for sharpening the blades, spare parts, tools and other supplies; and he also had to furnish transportation for the crew. As a result, this method of mowing was very expensive. Also, the cost of keeping up a sickle mower is usually greater than the cost of operating the tractor itself, provided the machine is used continually, day in and day out.

For the past two or three years, our field forces have leaned toward the use of the rotary type pasture mowers. These machines are pulled directly behind the tractor and will cut a swath 5 to 7½ ft. wide, varying with the make of mower. We have found these rotary machines to be much more economical than the sickle type mower and we have found, too, that they cut almost twice as fast. When we look at it this way we find that one tractor with a rotary mower which cuts about 6 ft. wide will cover almost as much area in a day as the older type unit of one tractor and mower and a trailer mower, requiring two operators.

We have now found that, by making use of a jeep to pull a rotary, we can send out a team. This consists of one tractor and rotary and the jeep and a rotary; and the jeep furnishes the transportation for the operators, eliminating the need for a truck. Also, when we are running a jeep and a tractor unit, we naturally don't have to have a foreman, so we let each man be his own boss. We don't feel that the jeep is quite as economical as the rubber-tired tractor for pulling the rotary mowers, but it does a very satisfactory job, and it furnishes also the needed transportation for the two men. In comparison with the foreman and the service truck, the operation is very economical. We have found it necessary to trade in the jeep after two seasons of work.

During the past two years, the switch-over from the sickle to the rotary type of mower has become very popular with us. And in connection with our program of shoulder and slope improvement, so that machinery can handle this work also, we are gradually reducing the need for hand labor in this phase of our highway maintenance program.

Lighting and Traffic Control

Lighting for the Portsmouth-Norfolk Bridge Tunnel

Opened in May, 1952, the Portsmouth-Norfolk Bridge Tunnel is used by some 12,000 cars traveling daily between Norfolk and Portsmouth. This is the tenth underwater vehicular tube in the United States. The lighting system features a continuous ribbon of fluorescent light almost two-thirds of a mile long on both sides of the tube. There are 332 fixtures in the 3350-ft. tunnel, each composed of two 8-ft. slimline GE fluorescent lamps, connected in series, and sealed in 16-ft. sections of clear Pyrex tubing. The portal areas use sealed fluorescent lighting units arranged in double rows, each of these being composed of two 6-ft. GE fluorescent lamps connected in series and sealed in a 12-ft. Pyrex tube.

Daylighting Intersections and Controlling Traffic

HARRY S. BRONSON,
County Engineer, St. Paul, Minn.

Our highway activities include road resurfacing, daylighting intersections, center striping, traffic control through signs and signals, maintenance and snow removal, operation of our centrally located Barber-Greene asphalt mixing plant, and operation of our highway garage and shop. We also are responsible for ice control, using salt and sand, and we do a lot of dust control, using light oil; also road stabilization. We have motor graders, front-end loaders, two power shovels, two crawler tractors, two road rollers, four bituminous distributors, thirty-five motor trucks, twenty-five snow plows and a considerable amount of smaller equipment.

Fluorescent Luminaires Light Alaskan Way Viaduct

Modern fluorescent street lights will provide virtually glareless illumination for the middle level of Seattle's new multi-million dollar Alaskan Way Viaduct. The lower and top levels of the new overpass, scheduled for completion in early 1953, will be lighted by conventional mercury vapor lamps. The center level, however, with a restricted mounting height of only 18½ feet, is too confined for the concentrated light of conventional lamps. Here, illumination will be provided by seventy-seven center-mounted GE fluorescent luminaires attached to the underside of the top level.

The fluorescent fixtures will be spaced at intervals of 60 feet along the 40-foot wide, mile-long roadway, and will provide an average constant light intensity of 2.5 foot-candles. The wide light pattern of the GE luminaire plus its maximum candle-power angle of 70 degrees makes it especially suitable for this particular installation.

The overpass will skirt the downtown Seattle business district and run along the waterfront section which borders Puget Sound. When completed, the second and third levels will shunt through traffic along Route 99 around the congested business section. The lower or street level will be used for local traffic. Construction phases of the viaduct were described in *Public Works* for December, 1951.

Resin Compounds for Pavement Stripes

"Experiments have provided a rosin-alkyd resin compound of unusual promise from the standpoints of durability and visibility in service. Its formula has been developed from that of a British rosin compound. Applied to the pavement in hot melt form, it is ready to withstand traffic in five minutes. It gives suitable service in either asphalt or concrete pavements.

"Experimental stripes of molten sulfur have also been laid on pavement. This has been used with and without plasticizer. The stripes of plasticized, molten sulfur have suffered little or no displacement or impairment of color in more than six months to date on pavement in a traffic area."—*Texas Engineering Experiment Station News.*

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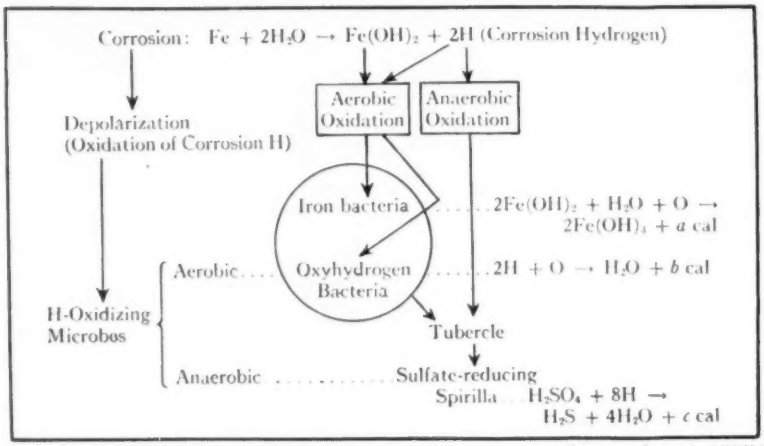
PUBLIC WORKS DIGESTS

THIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

THE WATER WORKS DIGEST

Aerobic and Anaerobic Corrosion in Mains

Mechanical stresses that develop in different parts of the iron during the production of water pipe provide the seat for cathodes and anodes on the iron surface. Clean, as well as poorly protected, iron surfaces are predestined to corrode in the anodic areas. The primary internal corrosion reaction $Fe + 2H_2O \leftrightharpoons Fe(OH)_2 + 2H$ moves to the right if the corrosion hydrogen and ferrous hydroxide are removed from the chemical equilibrium; during aerobic corrosion, this removal occurs by chemical oxidation; which is soon displaced by a biochemical oxidation caused by oxyhydrogen bacteria and iron bacteria, the former oxidizing the corrosion hydrogen into water on the cathodic iron surface, and the iron bacteria oxidizing ferrous to ferric hydroxide on the anodic area. The localized accumulation of iron rust, bound by iron bacteria and strengthened by incrustations of calcium carbonate, manganese dioxide and other compounds, induces the formation of tubercles. The soluble ferrous compounds diffuse to the surface of the tubercle where they are oxidized by iron bacteria. The insoluble hydroxide deposits in layers, increasing the size of the tubercle. If the oxygen consumption of the iron bacteria is high, the inside of the tubercles may gradually become anaerobic, which condition is a prerequisite for the development of sulfate-reducing spirilla, which change the aerobic corrosion inside the tubercle to anaerobic corrosion. A schematic representation of the iron corrosion process is shown herewith.



Courtesy Journal AWWA

● **AEROBIC and anaerobic iron corrosion in mains.**

C. A. H. Von Wolzogen Kuhr and L. S. Van der Vlugt—"Aerobic and Anaerobic Iron Corrosion in Water" (Translated from the Dutch by Willem Rudolfs): *Journal, American Water Works Ass'n*, January.

Manganese Content Caused by Storage

Although manganese occurs in geologic formations over wide areas of Georgia, little of it goes into solution under normal conditions of stream flow. But in recent years, the construction of impounding reservoirs by federal agencies, industries and municipalities has created conditions along several streams favorable to the solution of manganese, together with other elements. This is due in part to the depletion of oxygen, formation of carbon dioxide and lowering of pH, which frequently occurs in the bottom stratum of such reservoirs. At times the water leaving these reservoirs contains manganese in amounts sufficient to be objectionable to downstream consumers.

W. H. Weir—"Water Pollution Control in Georgia;" *PUBLIC WORKS*, February.

Red Water Prevention

There are at least three distinct sources of red water—the presence of iron or manganese or both in the raw water; a corrosive water supply; and growth of iron bacteria in the distribution system. Unless all three of these are taken into consideration, it is probable that treatment will be only partially successful. When the raw water contains more than 0.3 ppm of combined iron and manganese, removal is preferable to the use of chemicals to prevent deposition of iron or manganese in the distribution system. The principal basic methods of removal include aeration followed by coagu-

lation and filtration, pressure aeration and filtration, and cation exchange. Without treatment other than aeration and filtration, treated water will revert to a high-ion water in the dead ends very rapidly.

Cation exchange normally results in a soft water having a combined iron and manganese content of less than 0.2 ppm. If a hardness of 70-85 ppm is desired and the combined iron and manganese content is less than about 1.0 ppm, blending untreated with treated water can provide a water of less than 0.3 ppm iron and manganese. Another method is to remove the hardness, iron and manganese from most of the supply, and iron and manganese only from the balance, mixing the two in any desired proportion. Another method is to soften the entire supply to zero hardness; the use of which is quite practicable if the corrosive tendencies are corrected. Adjustments with lime or sodium hydroxide to a pH of 8.2-8.4 usually eliminates iron pickup in the distribution system. Corrosion and iron bacteria usually occur simultaneously. The logical agent for controlling the bacteria is chlorine, either by continuous light dosage or by annual massive doses. Whatever other cure for red water is adopted, the author recommends circulation through dead ends.

Philip S. Davy—"Red Water and Its Prevention," *Journal, American Water Works Ass'n*, January.

Pipe Construction On Bridge Crossings

When a water main is laid on or otherwise supported by a bridge, the matters requiring attention include the method of attachment and support, the need for flexibility because of vibration and temperature changes, provision for resisting thrust at abrupt angles, and insulation against freezing. Attachment to the bridge varies with the type of bridge. Sometimes the pipe can be supported between girders or trusses beneath the floor; but more often it is necessary to carry it on hangers or brackets outside the principal bridge members. To allow for vibration of the bridge under traffic or wind pressure, one of the numerous standard types of flexible mechanical pipe joints should be used. For extreme cases, steel pipe may be used instead of cast iron. Except for short bridges, one or more expansion joints should be used, the pipe being so anchored to the bridge that, as the bridge changes in length, the change in pipe length will be

concentrated at these joints. Insulation against freezing is desirable in all cases in northern climates except on very short bridges where the water is in continuous circulation, day and night. This may be effected by use of commercial types of insulation, or by surrounding the pipe with a wood or metal enclosure filled with cork, sawdust, etc., which must be kept dry to be of any use. The author has used a mixture of a bushel of granulated cork and 3 gallons of coal-tar pitch.

George A. Howland — "Bridge Crossings;" *Journal, New England Water Works Ass'n*, December.

Physical Factors Affecting Flocculation

In articles dealing with floc formation, much has been written about chemical reactions, pH optimums, etc., but less about the physical factors. Little is known about optimum time and velocity of mixing. The author, as a result of both model tests and study of operation of existing plants, suggests a "displacement factor" as an aid in designing flocculating equipment. The "displacement factor," D/F, is the quotient of dividing D (the displacement total of the several volumetric displacements, in the direction of rotation, of all submerged paddles, braces and other rotating members other than the main drive shaft, in cfm) by F (the total water flow through the mixing unit, in cfm). A value of 35-40 for D/F has been found to give the best results. For a considerable variety of waters and treatment methods it may be desirable to so vary the speed of the flocculator as to increase the D/F by 20% or decrease it by 25%. To produce the maximum results for any given basin size, the width and spacing of paddles should be such as to give maximum turbulence without creating heavy roll of the water, to spread eddy formations throughout the whole liquid body and to keep them alive as long as possible.

Elwood L. Bean—"Study of Physical Factors Affecting Flocculation;" *Water Works Engineering*, January.

Plastic Tubing For Service Installations

Under this heading we published in our January *Digest*, abstract of an article by Carns & Flentje in *Water & Sewage Works* describing their experience with plastic pipe for services. The January issue of that magazine contains a supplementary statement by these authors, that

they later discovered that some of the clamps used with the plastic services contained parts not made of stainless steel and that these were corroding rapidly; and requesting that this information be given as wide publicity as was their original article.

Renaissance in Rockfill Dams

Rockfill dams originated about 100 yr. ago in California, where 25 are now in service. Last year three were built, in California, North Carolina and British Columbia, which contained some new features. One of these has a concrete slab face; the other two have sloping impervious rolled clay cores, which type is of fairly recent origin.. The primary advantage of the sloping core type as compared with the faced type is that the former is not subject to cracking because of continued settlement of the rockfill. Study of natural dams formed by terminal moraines indicated that a suitable filter just downstream of the impervious core would protect the core from moving through the rockfill; and a reverse filter on the upstream side, covered with rock, would protect the earth core from wave action and sudden drawdown. Comparing concrete and earth as impervious membranes, the former will crack as the rockfill settles, while earth will adjust itself to settlement. Also the earth is an end process of disintegration and no further change can be expected even in geologic time; while small amounts of water will seep through the concrete and slowly disintegrate it.

L. L. Wise — "Renaissance in Rockfill Dams;" *Engineering News-Record*, Jan. 22.

Private Treatment Of Public Supplies

A practice of supplementary treatment of water after it enters the Consumer's building has grown up, especially in large office and apartment buildings. Unfortunately, both the method of introducing treatment materials and the materials themselves may be harmful to consumers. The Detroit, Mich., Dept. of Health, finding such conditions existing in that city, considered three methods of preventing any dangerous features in connection with such supplementary treatment: 1—make it illegal to add treatment chemicals to building water systems; 2—so treat the water supply at the municipal plant as to make such treatment unnecessary; 3—require the use of proper equipment and personnel in all private treatment plants. They adopted the 3rd. Their ordinance requires the use of a dosing device that would make it impossible to add a chemical at a higher rate of dosage than that specified; it stipulates that no organic compounds be used to increase the total alkalinity, hardness, silica content, turbidity or color by more than a specified amount. The use of salts of hexavalent chromium or of sodium sulfite is prohibited. The regulatory method has proved satisfactory in Detroit and at least one other large American city.

Andrew T. Dempster—"Control of the Treatment of Water in Building Piping Systems;" *Journal, American Water Works Ass'n*, January.

Preventing the Freezing of Hydrants

Cities in cold climates handle the problems of frozen hydrants by one of two general methods—preventing freezing, or thawing. Several cities in Montana, Augusta, Me. and Ot-

tawa, Ont. keep their hydrants dry by plugging the drain and keeping the barrel pumped dry all winter. In Ottawa all hydrants are inspected daily. Other cities use some antifreeze in the hydrant. Type N denatured alcohol (to which rust and corrosion inhibitors have been added) has been popular but difficult to obtain. In some places in Minnesota, railroad watering devices are protected from freezing by wrapping with electric thermotape.

"Cold Water Protection for Hydrants;" *Journal, American Water Works Ass'n*, January.

Procedure for Scheduling of Mosquito Fogging

Malaria and Mosquito Control Unit #1, at NAS Jacksonville, Fla., has explained the procedure it uses for scheduling mosquito-fogging operations according to the Navy Medical News Letter. It is based on a survey of the need, since regulations require that such a survey be made and that only when results show that the prevalence of mosquitoes justifies the expenditure should the fogging operations be employed.

Traps are set out at 5 strategic locations on the station, and the various species collected are identified each day. Florida has over 70 species of mosquitoes, but less than 25 are serious biters of man. It has been decided that when more than 15 of the biting-type species are caught in a single trap in one evening, the fog jeep should be used; when there are large numbers in most of the traps, the spray plane swings into action.

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Refuse Disposal in San Diego County, Calif.

To serve the population of San Diego Co., Calif., both in unincorporated and incorporated areas, 20 sites are now provided for the disposal of refuse. The County Department of Public Works, of which Jean L. Vincenz is Director, provided some 20,000 man-hours during 1951 in preparing, operating and maintaining these facilities. At two of the sites, regular classified county employees are maintained as caretakers, these men being assisted by sending in heavy equipment regularly. Four of the sites have no regularly assigned personnel, but are cared for as needed by men from the Division's labor pool. Limited maintenance is given three of the sites and routine caretaker service is provided by contract. The site near Coronado is covered by an agreement with that city. The remaining ten sites are operated by full-time private caretakers who have salvage rights plus a small contractural payment, the county furnishing maintenance equipment as required.

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Saline and Brackish Water Research Started

WHILE desalting of sea water is the major project, solution to the problem of economical treatment of brackish water will also be sought under a research project recently initiated by the U. S. Department of the Interior. The program that has been laid out provides for long-range research and the methods and equipment necessary to convert sea water and other saline and brackish waters into potable water. The aim will be to make such water suitable for irrigation, industrial and domestic purposes. The research program will be aided by a committee of nine men well known in the fields of science, industry and education.

The nine are: Dr. Robert G. Sproul, president, University of California; J. J. Cronin, vice president, General Motors Corp.; Dr. Louis Koenig, director of research, Southwest Research Institute, San Antonio, Tex.; Henry J. Schmitt, editor and publisher, The Aberdeen American-News, Aberdeen, S. Dak.; Dr. Lee a DuBridge, president, California Institute of Technology; Dr. George D. Humphrey, president, University of Wyoming; Dr. Sheppard P. Powell, consulting engineer, Baltimore, Md.; Dr. Frederick L. Hovde, president, Purdue University; and Dr. James R. Killian, Jr., president, Massachusetts Institute of Technology.

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Illinois Maintenance

(*Continued from page* 74)

use. Quicker means of filling are needed.

Mixing Concrete

The changing character of highway maintenance operations is illustrated in the development of commercial ready - mix concrete plants. So many of them have been erected throughout the State that the use of small portable concrete mixers for pavement patching and small jobs has measurably decreased. The Bureau of Maintenance owns 49 small mixers most of which are old type and their use has decreased due to the fact that ready mixed concrete can be transported with increased efficiency from permanent plants.

The use of air compressors however has remained constant and 62 of these are available. Their capacity varies from 105 cubic feet to 210 cubic feet. Seven of the units are 210-cubic foot size. The trend is toward the use of the 160-cubic foot units with the 105-cubic foot size gradually being replaced with the larger machines. These compressors are used for a variety of purposes principally for the breaking out of concrete where replacement patches are required. The standard type of pneumatic concrete breakers are used with these machines.

Sign and Marker Problems

One of the problems which has not been solved to our satisfaction is that of washing or cleaning highway route markers and warning and direction signs. Many of these signs when set on the outside shoulder edge of two-lane highways become splashed with mud thrown by passing motor vehicles. As the signs are necessary for the benefit of motorists, they must be kept clean and legible. Although a number of different methods and materials have been used the results are not always satisfactory and are often slow and cumbersome. The washing of these signs by hand with cold water during inclement weather is not popular with the workmen, and as the signs are scattered thinly over many miles of roads, transportation of men and cleaning equipment further reduces the speed with which the work can be done. Some washing solutions have been tried which have damaged or destroyed the paint. Other material was ineffective on certain reflectorized types of signs. There is need for increased efficiency in the materials, equipment and methods used for cleaning these signs.

One of the major expenses is the cleaning of debris, such as paper, bottles, tin cans, miscellaneous discarded boxes, and light objects from the roadsides. A clean right-of-way makes an attractive road to ride on, but one which is cluttered with debris, as above mentioned, gives a bad impression to the traveler and

conveys the feeling that there is a sloppy attitude on the part of the maintenance workers even though the pavement and shoulders are in good condition. Much of this material also creates difficulty for the mowing equipment and causes breakage of mower knives. The roadside cleaning work at present is done by hand. Along some roads near cities, it takes at least one day's time per week for the working crew. It is impossible to prevent motorists from dumping garbage and waste papers, bottles, cans and similar trash onto the highways. We would be thankful, indeed, if practical equipment could be developed to reduce this item of cost.

Force Account Work

The Day Labor organization handles the force account and emergency work in which contractors are not particularly interested or which do not readily lend themselves to contract methods, but are too large for the regular maintenance organization. To perform these operations, crews are set up for handling grading work; pavement subsealing; portland cement concrete pavement patching; incidental gutter and one-lane pavement construction; bridge repair and emergency construction to replace washouts; seal coating; and construction of frontage roads and approaches.

For pavement subsealing, Day Labor uses two drilling units mounted on farm tractors and towing compressors: one self-propelled compressor and drill; two 1,000-gallon distributors; one 4,000-gallon semitrailer tank; and three circulating tank car heaters. For the seal coating jobs, they use asphalt distributors, stone spreaders, and steel and rubber tired road rollers. Day Labor seal-coated 720,000 square yards of bituminous surfaced roads this year. For shoulder and ditch grading and other incidental grading jobs there are two scoops, one of 7 cubic yards and one of 9 cubic yards capacity, operated by crawler tractors, and 9 motor patrol graders. There are also two belt loaders, four endloaders and 3 sheepsfoot rollers.

The crews doing concrete work are equipped with five 2-cubic yard mixers, one bin batcher, one three-sack concrete mixer, a material bin, and the usual complement of trucks. There are also one ¾-cubic yard crane on crawler tractor and one ½-cubic yard crane on rubber tires.

The heaviest grading work performed on shoulders and ditches during 1952 was on US Route 45 in the southern part of Will County and on Illinois Route 121 between Mattoon and Bethany. This crew moved 110,000 cubic yards of dirt during the season. The pavement subsealing jobs were scattered in different parts of the State and more than 1,500,000 gallons of asphalt were used in this work.

In all there were eight gangs in operation during the construction season at one time or other, all under the direction of the Day Labor superintendent.

The bridge gang placed new wood floors on several bridges, constructed a temporary wooden bridge and a short detour to pass traffic around a washed out bridge, and placed a bituminous concrete floor over a steel grid floored bridge which had caused accidents due to icy conditions. The crew assigned to concrete patching placed a total of 19,000 square yards during the season. The equipment used by the Day Labor gangs is of the conventional type ordinarily used by contractors There were no exceptional pieces of equipment or unusual or special types of work to which they were assigned.

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PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Preventing Skidding On Oily Pavements

The Connecticut State Highway Dept. has developed a successful method of treating oil slicks on pavements to prevent skidding. The most troublesome places were parkway toll plazas, hills and curves. To reduce the danger, sand is spread over the slippery area in a thin layer. A rotary broom with wire bristles then sweeps over the spot, clearing from the surface the sand and the combined grease. The intervals between treatments vary from once a month to once a week.

W. C. Murray — "Connecticut Scours Hazardous Slick Spots;" *Better Roads*, January.

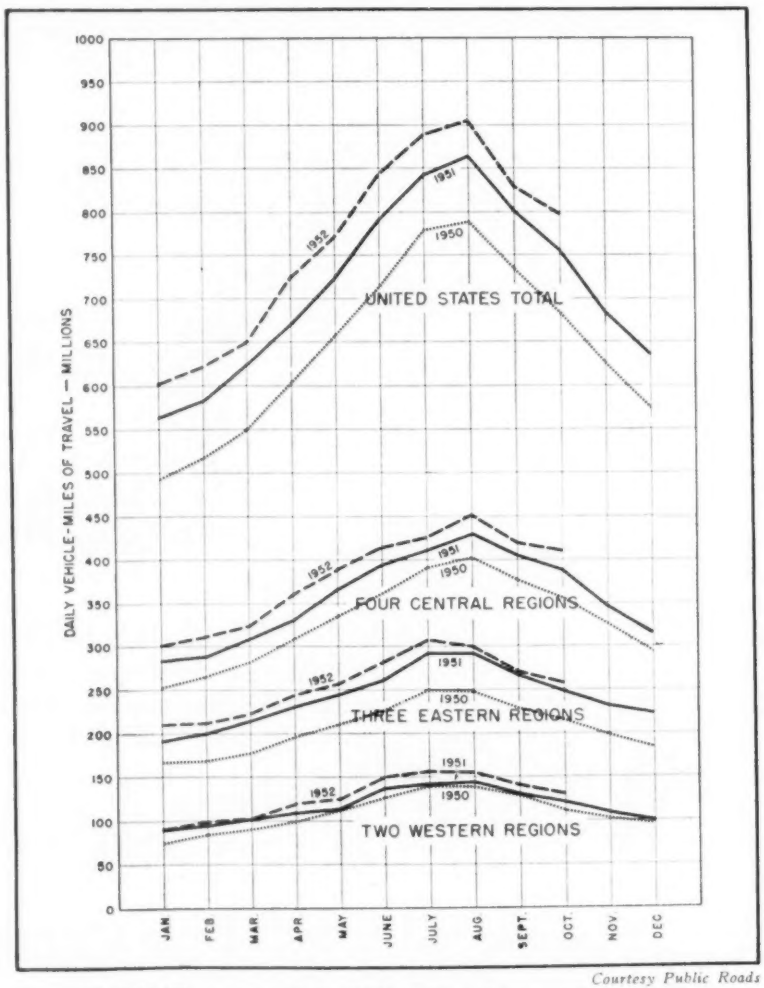
Motor Vehicle Travel On Rural Roads

Total travel on the 356,000 miles of main rural roads was about 7% greater in 1952 (data for the first 10 months) than in 1951. The 1951 traffic was 10% greater than that of 1950, 20% greater than in 1949, more than 39% greater than in 1947 and more than 52% greater than in 1946. Of the 190 billion vehicle-miles in 1951, 78% was by passenger cars, 1% by buses and 21% by freight-carrying vehicles. The average carried load for all trucks and combinations in 1951 was less than 1% above the average in 1950.

Thomas B. Dimmick—"Trends in Traffic Volumes, Vehicle Types and Weights," *Public Roads*, February.

Cracks in Asphalt Over Joints in Concrete Base

When an asphalt surface is laid on a concrete base, movements of the latter tend to cause cracks in the asphalt above the joints in the concrete. The British Road Research Board for two years has been conducting experiments to learn how this cracking can best be prevented. Various types of roofing felt and of expanded metal were placed over the cracks in the concrete. None of the felts was effective, but the use of expanded metal gave promising results. In one experiment, 22 joints were covered with a light-gauge expanded metal having a 1½-in. mesh, on which was laid a 1½-in. rolled asphalt surface. After two years no cracks have appeared over 17 of these joints and only very small cracks over the other five. All but one of the untreated joints on the same site have produced cracks, many of them serious. They recommend that, in adopting this method, joints in the concrete that are badly



Courtesy Public Roads

● **TRAVEL on all roads in 1950, 1951 and ten months of 1952.**

worn be cleaned out and filled with fine cold asphalt. The expanded metal should be laid 3 ft. wide, transported flat and not in rolls, so that it will lie flat on the road. And every precaution should be taken to maintain the sheets flat while the asphalt is being placed and rolled.

A. T. J. Hayward—"Interim Recommendations for Using Expanded Metal Under Rolled Asphalt to Reduce Cracking Over Joints in Concrete;" *The Surveyor*, Jan. 17.

Making Cuts in Concrete Pavements

In making cuts in concrete pavements, it is advisable to saw-cut a groove to the depth of about ¼ the thickness of the concrete slab, outlining the sides of the proposed excavation. An initial breaking of the concrete is usually made midway between these outline cuts: followed by a final pass along each side. The biggest single factor in successful patching is through compaction of the backfill. Next in importance is the preparation and application of the concrete. It is recommended that the maximum size of the aggregate be limited to 1½ in. The amount of cement need not ordinarily be greater than that used for paving concrete with the local aggregate—say 6 sacks per cu. yd. Quick setting can be obtained by using 2 lb. of calcium chloride per sack of cement, or high-early-strength cement. The mix should be made as stiff as it can be placed —about 1½ to 2-in. slump, and allowed to begin to stiffen before it is tamped. Painting the cut edges with cement grout is probably not justified, but they and the subgrade should be dampened before placing the concrete. Finally, proper curing for 72 hours is very important.

"Saws for Making Concrete Pavement Cuts;" *PUBLIC WORKS*, February.

Multi-purpose Equipment For the Armed Forces

To satisfy military requirements, the construction-equipment industry is developing new concepts of basic earth-moving equipment with particular emphasis on more versatile and faster multi-purpose tractors, scrapers and graders. But while these are desirous for military use, civilian use of such equipment is not anticipated for some time, due to higher initial cost, more complex operation, and the fact that present equipment is generally adequate for

civilian needs. Instead of a 3-piece combination of tractor-scraper with a pusher tractor, the military engineer prefers a rubber-tire tractor-scraper combination with all-wheel drive. Two outstanding examples are the Austin-Western CB100 6-wheel-steer and drive power grader, and the Le Tourneau 6-wheel-drive electric scraper, which weighs 54,000 lb. unloaded and has a capacity of 14 cu. yd. heaped. (It is now possible to air-land or airdrop machines weighing up to 16 tons).

Contrasting with the progress in power-train design, knowledge of how to improve tractive effort is sadly inadequate. The tractive effort developed by both wheels and tracks is a function of the internal friction of the soil and its cohesive strength. The latter is independent of vertical surface pressure: therefore to increase the tractive effort, the shearing area in the soil must be enlarged by increasing the size of the track or by using multiple wheels.

D. A. Hausmann—"Military Earth Moving Equipment;" *Roads and Streets*, January.

Highway Maintenance On Georgia's State Highways

The voters of Georgia last November approved a constitutional amendment requiring that all net funds from motor fuel taxes and motor vehicle license fees be appropriated exclusively for improvement of roads and bridges through the State Highway Dept. As a result, that department will have this year about $60,000,000, or about twice as much as was ever appropriated for its use. About $10,000,000 of this will go for maintenance (including new equipment) of the 15,228 miles of roads in the State highway system, of which 11 085 miles are paved.

Much of the betterment and maintenance work involves widening old 18-ft. concrete roads to 24 ft. For this they use a special widening machine to cut the trench, in which a two-course penetration pavement is normally placed. In resurfacing the old concrete, cold-mix is laid in some cases, using Hetherington & Berner Moto-Pavers; in other cases hot mix is laid, using Barber-Greene continuous-mix plants. Depressions are leveled up ahead of the final surfacing by dumping and spreading pre-mixed material long enough in advance to permit traffic to compact it. In some places where the pavement was broken badly they placed an entirely new pavement, including 2½ in. penetration base, but have concluded it is more practical to omit the new base and apply only a binder and leveling course with a dense top. Many of the 3600 bridges in the system need complete rebuilding, and for this, pre-cast concrete deck structures will be used largely.

C. E. Wright—"More Money and New Equipment for Georgia Highways;" *PUBLIC WORKS*, February.

Some Hints on Soil Cement Construction

In constructing 23 miles of soil cement base in Kentucky last year, the contractor averaged about 5 000 lineal feet per day of pavement 19 ft. wide with 6-in. compacted thickness with a maximum run of 6,295. The summer was one of the hottest on record, which necessitated applying more water than is usually required. Pressure water distributors instead of gravity would have been an advantage. Because of the hard ground, it was necessary to make more passes with the rotary mixers to break up the clods of the old surface than had been antici-

pated. Fortunately the contractor kept on the job a well-equipped maintenance and repair truck, which carried welding apparatus and an assortment of spare parts.

C. B. Owens — "Soil-Cement Methods on Kentucky Federal Secondary Road Project;" *Roads and Streets*, January.

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Subdivisions

(*Continued from page* 62)

agencies to save them. No new elms are planted. Last fall we planted many pin oaks and some red oaks.

Construction Standards

The actual construction standards are patterned after N. J. State Highway specifications in general. We require a stone base for pavements, the depth depending on the character of the subsoil and the amount of travel the road is to receive. The base material is crushed stone bound in with dust. For the top course we have a choice of two methods but we lean very much toward the following: a modified penetration of 2-inch depth, using 1½-in. stone and 1 to 1½ gallons of asphalt or tar per square yard; covered with just enough ½-inch stone to fill the voids; followed by 1 to 1½ inches of bituminous concrete. For the past two years we have been using a special mix labeled SH by the State Highway Dept. This is a medium temperature mix, easily workable, with a good non-skid surface. The alternate surface is a standard penetration macadam road 3 inches in depth using 1½-inch crushed stone with two applications of asphalt or tar, 2¼ to 3 gallons per square yard, followed by a seal coat after several weeks use. All utilities must have been laid, and preferably laterals to the curb installed, before placing the final pavement. We notify the property owners that the street will not be permitted to be opened within five years except in an emergency. In has been our experience that it is very difficult to replace a street opening of the type of road mentioned above and not leave a scar or a depression.

The crown for the bituminous concrete road is kept to a minimum. A slope of 3 inches to 4 inches, or about ¼ inch to a foot to the gutter, gives good results. We require no gutters, the road surface extending to the curb. The concrete curb is 6 inches wide at the top, 8 inches at the bottom, and 18 inches deep. In

the past we have used a 1:2:4 mix, using either ¾-inch gravel or stone, but recently we have accepted a 1:2:3 mix recommended by the Portland Cement Association, using air-entraining cement and a larger coarse aggregate, 1-inch to 1½-inch in size. We have been using air-entrained concrete for two years and believe it to be the solution to much of our curb trouble. Most of our curb has been laid in 10-foot sections, but last year we permitted 20-foot sections and as a result very fine shrinkage cracks occurred. Concrete made of air-entraining cement takes longer for its final set so that more care should be used in curing and protecting the structure during this period.

Sidewalks are constructed the same as curbs with the coarse aggregate a little smaller. They are 4 feet wide, and 4 inches thick, except at a driveway where they are 6-inch. Aprons of concrete or bituminous material are constructed for driveways. The sidewalk is usually set in the center of the area between the property line and the curb with grass grown between it and the curb.

Standard inlets and catch basins with proper size drains are essential on most streets, particularly where surface drainage is bad. We install such drains only for road drainage and not for house connections, such as cellar drains. Roof leaders may be connected if practical. Gratings for inlets and catch basins are approximately 21 by 48 inches and weigh, with frame, about 2500 pounds. We install catch basins only where absolutely necessary for they become a nuisance when they hold water for any period of time. As a rough method of design we use 1.5 to 2 cubic feet per second per acre of contributing drainage area in estimating the size of the drainage pipe necessary.

These standards and regulations along with some of our experiences may be of help to other municipalities. It is hoped they will start a discussion particularly as to pavement widths for urban residential streets in an existing town.

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Plastic Material Has Properties of Steel

A special nylon plastic is reported by Dr. Miklos Hetenyi, professor at Northwestern University Technological Institute, which has the properties of steel. Scale models can be made of this material and subjected to stresses. Plastic materials were previously available which would duplicate the properties of steel in the elastic range, but not when permanent deformation took place. The new nylon, a product of du Pont, duplicates steel even where permanent deformation occurs.

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Landfill by Contract

(*Continued from page* 63)

this rough, abrasive material, the contractor chose an International TD-14A Tractor equipped with a two-yard Drott Bullclam Shovel. With this rig, one man carries on the entire operation. Each load of refuse is brought in and dumped immediately, no time being lost at the fill. Because of the hilly terrain, no accurate planning of a large area job is attempted. Rather, the fill consists of a series of ramp operations. The Bullclam solidly compacts the refuse as it is dumped and covers it up immediately with a thin layer of earth. This procedure is repeated until the particular area has been raised to the desired level.

● **WORKING on the fill at Oneonta where disposal is by 10-year contract.**

Then a two-foot layer of dirt is thoroughly compacted over the buried refuse. The operator of the Bullclam manages the sanitary fill and periodic inspections are made by the health department.

The fill receives up to 50 tons of refuse per day. Besides the regular collections, truckloads of miscellaneous refuse from private industries and citizens come in at the rate of about 50 per day. Each family unit is charged a maximum of 35 cents per week for the service. The city pays for the site and for operation of the fill. Institutions and industries are given special rates according to the amount of refuse collected and the haul distance to the site. Every kind of refuse material is included in the fill except brush and trees which are burned because they would interfere with compaction. The operator is on the job every day from eight to five—these are dumping hours. No dumping is allowed from Saturday noon to Monday morning and the fill is closed every night. With these regulations, all dumping is completely supervised. There is little trouble with blowing paper because of the terrain and because the refuse is quickly covered. Drainage is good and haul roads are kept in excellent shape. Preparations for winter include: opening several banks to make loose fill easily obtainable; moving the fill site to the most sheltered location and building a garage for the tractor. The Drott - International combination was purchased in July, 1952 and had logged about 400 hours without any trouble up to the time this story was written.

In addition to keeping the sanitary fill in good shape, the Bullclam is being used to reclaim land at the former dump. The tractor travels under its own power between the two sites which are fairly close together. The old dump is being covered with a two-foot layer of earth which is compacted in much the same manner as the sanitary fill. The value of the land at this old dump site has greatly increased since it has been improved.

City officials are proud of the operation and pleased with citizen reaction. The Simonson brothers are enthusiastic about the business possibilities of sanitary fill. Marvin Simonson, experienced in the business of refuse disposal, has this to say about sanitary landfill: "We cannot see how any city that has a concern for the health and welfare of its citizens, present and future, can be without this method. Without reservation, we can truthfully say that it is the cheapest and most practical solution to this problem of refuse disposal."

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PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Biological Methods For Treating Radioactive Wastes

Disposal of radio-active wastes may include physical, chemical, biological methods or a combination of them. The biological treatment which would be applicable to relatively low-level radioactive waste includes activated sludge, trickling filter, and absorption by algae and other plankton forms. It is not indicated for soluble isotopes that are not utilized or readily absorbed on biological floc; nor for treatment and removal of isotopes of elements which are isotopically diluted by constituents in sewage. It may be used for the removal of isotopes, such as plutonium, which have no isotopic dilution and which are easily absorbed by the zoogleal floc under proper conditions. Also for waste containing, in addition to the radioactive isotope, organic materials which sequester or prevent chemical treatment for the removal of the activity; in which case the biological system is used simply to remove by oxidative assimilation the organic sequestering constituents. Following such removal the effluent may be chemically treated by flocculation, carrier precipitation, or other methods to remove the radioactivity.

C. C. Ruchhoft and L. R. Setter —"Application of Biological Methods in the Treatment of Radioactive Wastes;" *Sewage and Industrial Wastes*, January.

Charging For Industrial Wastes

In this article, the third of a series, the author discusses the bases for the various formulas for charging for the treatment of industrial wastes. Some twelve formulas are discussed, in which weight is given to volume, BOD, Suspended Solids, Chlorine, excess BOD, excess SS and credit for taxes. Six plans are presented for approaching the problem of handling industrial waste treatment by agreement between the industry and the municipality.

E. B. Besselievre — "Industrial Wastes — A Community Problem"; *PUBLIC WORKS*, February.

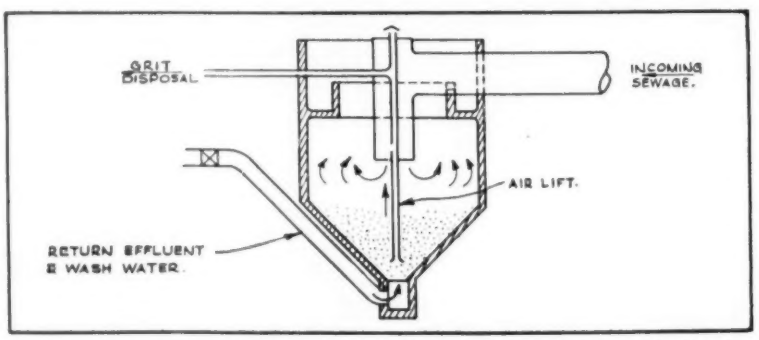
Bottom Animal Life of Rivers and Lakes

Quantitative studies of the bottom animal life of a river or lake can usually be relied upon to give a picture of the water quality that has prevailed in a given area over varying periods. The greatest variety and bulk of bottom animals occur in swift water, where there are gravel riffles and flat rocks, because of the higher oxygen and food content of the water. Insects found here include caddisfly larvae, stonefly nymphs, midgefly and beetle larvae, snails and hellgramites Ordinarily sewage pollution reduces the number of species to a few kinds which are specially adapted to living under low-oxygen conditions; but domestic sewage in quantities so dilute that oxygen levels through the day and night may be maintained continuously above about 5 pm may actually feed bottom animals by stimulating the growth of microscopic plants and animals upon which they feed. Pollution by chemicals or toxic wastes generally wipes out certain species; even the normally pollution-tolerant tubificid worms may fail to survive pollution by zinc, copper, phenols, etc. In the Kalamazoo river, above Battle Creek, 22 species of bottom animals, totaling 729 individuals, were found in a square foot of the bottom. Below that city's sewer outlet only 3 species were found.

Eugene W. Surber — "Biological Effects of Pollution in Michigan Waters;" *Sewage and Industrial Wastes*, January.

Preventing Sewer Freezing in Alaska

The city of Fairbanks, Alaska, spends about $20,000 a year in thawing frozen sewers in its system which totals 13 miles and contains more than 100 dead ends. The freezing is largely due to the small amount of sewage flowing. They found a solution by installing, in a 4-ft. manhole at the head of a dead end, a flush tank that discharged 115 gal. per flush, and a pump that drew 825 gph from a well. Water in this manhole was prevented from



Courtesy Contractors Record and PW Engr.

● **AN ENGLISH grit separation tank. See February Public Works, page 101 for a full description and reference.**

freezing by burning a 25-w. light bulb in it, which proved to give sufficient heat even with outside temperature down to —50° F.

Edwin M. Lamphere—"Flush Tank Used to Prevent Sewer Freezing;" *Sewage and Industrial Wastes,* January.

Treating Milk Waste By Activated Sludge

Use of the activated sludge process for treating milk waste has come into increasing favor during the past three or four years. A recent development is treating both the milk waste and the sludge resulting from treatment in one operation. The author describes the results obtained by three plants of this type; all of which operate at dairies which normally run only one shift a day and where the character of the sewage changes radically and the rate of flow varies more than 1,000%. The plants contain an aerated holding tank, the function of which is to equalize the flow through the rest of the plant and composite the raw sewage before it goes to the aeration tank. Construction details are aimed to convert the highly fluctuating and contaminated flow into the holding tank into a continuous and nearly constant flow through the aeration and settling tanks. A holding tank is not required for a plant operating on a 3-shift basis.

Paul M. Thayer — "Milk Waste Treatment by Activated Sludge;" *Water & Sewage Works,* January.

No More Gripes About Garbage

Buying new and adequate equipment, developing a good organization and training and supervising the garbage and refuse collectors to provide service acceptable to the citizens eliminated garbage collection complaints in Poughkeepsie, N. Y. An incentive program, including wages, makes Sanitation Department jobs especially desirable and there is no turnover problem as regards to labor. Good equipment reduces maintenance costs and permits adherence to collection schedules.

"No More Gripes About Garbage"; *PUBLIC WORKS,* February.

Designing Sedimentation Basins

Evidence was presented nearly 50 years ago that removal of suspended matter by settling depends upon the floor area of the tank and not upon the tank volume. The rapidity of settling is increased by the coagulation of the small particles to form larger ones — flocculation. Theoretically, the removal is independent of the depth of the tank, but a minimum limit to the depth is placed by practical considerations, such as space required for sludge-removal equipment, and limiting speed of flow to prevent scour. The velocity in conventionally designed sedimentation basins is generally less than 3 ft. per min.; but there is evidence that velocities as high as 12 to 18 ft. may be used in properly proportioned basins without scour of sludge from the bottom of the basin. Overflow rates in common use for primary sedimentation of sewage range from about 200 to 1,000 gpd per square foot.

A sedimentation basin may be considered as divided into four zones, inlet and outlet zones, in which there is necessary turbulence, and between them an upper settling zone, and under it the sludge zone (which may be neglected where there is continuous sludge re-

moval). The longer the tank the longer the settling zone and, within limits depending on the settling rates of the suspended matter, the more complete the sedimentation. Covering a basin will minimize vertical convection currents caused by the sun and horizontal surface currents caused by the wind. Preflocculation prior to primary settling is extremely important. Once the floc is formed it should be handled gently; not pumped or led to the settling tank through conduits that produce high velocities.

Thomas R. Camp—"Studies of Sedimentation Basin Design;" *Sewage and Industrial Wastes*, January.

Sludge Heating at the Cleveland Southerly Plant

Cleveland's Southerly treatment plant, which has been in operation for almost 25 yrs., has insufficient capacity to treat adequately the greatly increased amount of sewage brought to it. The original digestion tanks were heated by means of spiral coils of 3-in. pipe; the heat being provided by hot water boilers which had an output capacity of 442,368,000 B.t.u. per day; supplemented by 96,000,000 B.t.u. available from the cooling water from gas engine-driven blowers. There was abundance of heat available, but the average tank temperature during December, 1951 was only 66°. It was found that scaling and deposits on the coils had reduced their heat transfer value to 4.4 B.t.u. per hr. per sq. ft. per degree of temperature differential. After cleaning the coils, the heat transfer coefficient was substantially increased. It was found also that temperatures at different points in the tank varied from 4° to 18° in zones from the top to the bottom. Also fluctuations in the amount and temperature of the liquid sludge entering the tanks caused considerable variations in gas production. It was believed that sludge should be heated to optimum temperature before discharge into the digestion tanks and that this could be accomplished best by the use of external heaters of the heat exchanger type. Radiation losses in the 12 original digestion tanks will be compensated for by the continued use of the heating coils. In the 6 new digestion tanks radiation losses will be made up by recirculating the digester contents through one or two external heat exchangers. In heating the incoming sludge, all the gas engine waste heat will be utilized first, and the balance of the heat necessary will be supplied by water from the existing boilers. Indicating thermometers are provided at all water and sludge inlets and outlets, and recording thermometers on all sludge and hot water inlet and outlet headers. Seeding incoming sludge can be accomplished by turning over the contents of the digester receiving it at the same time it is being introduced or immediately thereafter.

Frank S. Palocsay—"Design Features of the Cleveland Southerly Sludge Heater Installation;" *Sewage and Industrial Wastes*, January.

Removing Grit From Imhoff Tanks

Pontiac, Mich., finds large quantities of grit and other heavy solids collecting in its four Imhoff tanks, the removal of which has become increasingly difficult. At first a 4-in. diaphragm pump was used to pump the grit onto an outside platform, but rags, coal, wood, etc., caused frequent stoppages. Looking for a pump that would pass anything that would pass through the 8-in. sludge drawoff line, they de-

cided on air-lift, which is now in use. A ½-in. air pipe was inserted in the sludge drawoff riser, and sludge and grit were discharged into a concrete box, where the grit settled and the sludge flowed back into the Imhoff tank. Later an old garbage truck was substituted for the grit tank, which eliminated the hand shoveling of the grit into a truck for removal.

Floyd L. Vermette—"Removing Grit From Imhoff Tanks;" *Wastes Engineering*, January.

Data on the Aero-Filter

Basic information on the design of the Aero-Filter includes data on recirculation and loading—2 lbs. per cu. yd. normally; 1½ lbs. for nitrification and a 30 ppm BOD effluent; on filter depths; and on operating results. The author also discusses at some length the causes and remedies when inferior results are being obtained, including excessive loading, poor distribution, improper recirculation; strong supernatant return; poor rock sizing; and the presence of oil in the sewage.

J. A. Montgomery—"Engineering Data on the Aero-Filter"; *PUBLIC WORKS*, February.

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Industrial Waste

(*Continued from page* 79)

of BOD reduction. Similarly wastes from the dyeing, finishing and bleaching of wool can be handled on trickling filters.

McCarthy also has concluded that wool dyeing wastes could be treated satisfactorily on trickling filters at BOD loadings similar to those used for sanitary sewage.

Viscose rayon wastes at Front Royal, Va., have been handled on high rate trickling filters with recirculation. The wastes contain hydrogen sulphide and CS_2, and the wash water contains free chlorine and other alkaline discharges. A typical composition of such wastes was H_2S 0.004%; CS_2 0.01%; NaOH 0.05%; and cellulose, together with carbonates, sulphates and free sulphur, in small quantities. The BOD of the raw wastes averaged 300 ppm. When acid was added to bring the pH to 8.0, the filter loading could be increased to 1050 pounds of BOD per acre-foot. At this loading, 100 percent of the BOD was reduced. Without acid correction, a loading of 300 pounds per acre-foot produced a reduction of 90 percent. Later when the filter was properly conditioned, a reduction of 95 to 100 percent of the BOD was obtained with a 500-pound loading.

Pharmaceutical Wastes: Wastes from plants producing penicillin, aureomycin, streptomycin and other of the newly developed antibiotics have been found to respond to treatment on trickling filters. The usual plant comprises storage and equalization tanks, grease flotation unit, aeration, sedimentation and high rate trickling filters followed by final sedimentation. Filters are designed to handle 4300 pounds of BOD per acre-foot, with 6 foot depth of stone, and an average recirculation ratio of 3 to 1.

Lederle Laboratories of the American Cyanamid Co. at Pearl River, N. Y., treat a combination of wastes from the production of penicillin and aureomycin. The strong beers have a BOD of 4000 to 8000 ppm. The total volume of the wastes averages 400,000 gpd. Pilot plant results showed BOD reduction of 71 percent with raw waste BOD of 2500 ppm reduced to 725 ppm with a

loading of 12,000 pounds per acre-foot and recirculation of 8 to 1. On a full-scale plant aureomycin wastes are satisfactorily treated on three 100-foot filters, 6 feet deep, preceded by aeration.

Upjohn Co. at Kalamazoo, Mich., treats penicillin and streptomycin wastes. The plant comprises holding tanks with 10 hours detention, primary sedimentation tanks with two hours detention, and two 90-foot trickling filters with 6 feet of stone. Filters are loaded at the rate of 1500 pounds BOD per acre-foot per day and can be operated in series or parallel. An overall BOD reduction of 97 percent has been obtained with recirculation.

Heyden Chemical Corp., Princeton, N. J., treats penicillin wastes. Pilot plant tests were made on trickling filters operated in various combinations on waste flows of from 1 to 30 gpm with raw waste BOD of 4000 ppm. Aeration for 24 hours reduced the BOD of the wastes from 4000 to 1200 ppm; and the trickling filters are expected to remove 50 percent of the remainder at loadings of 1.5 pounds per cubic yard. Two 9-foot diameter filters with 4 feet of stone, using rotary distributors, are the primary units. The secondary filter is 21 feet in diameter and 8 feet deep and is expected to remove 65 percent of the 600 ppm BOD remaining in the primary filter effluent. Loading is 0.15 pound of BOD per cubic yard. A motorized distributor doses at rates of from 0.4 to 6.0 mgad. It has been found that the most satisfactory rate of recirculation is 15 to 1 in each phase. The optimum filter efficiency was obtained with a shallow trickling filter loaded at 3.0 pounds of BOD per cubic yard. This produced reduction of 82 percent but when the filter was loaded at 0.2 pound per cubic yard, an efficiency of 97 percent was obtained. Forced ventilation, which is a feature of the type of filter used, was found to improve filter efficiency only when low rates of recirculation were used. Tests results showed that the following combinations were the most effective in BOD reduction: (1) shallow trickling filters followed by deep trickling filters; (2) three-stage shallow trickling filters; and (3) two-stage deep filters. It was found that each of these combinations would reduce the BOD approximately 99.3 percent from an initial waste of 4030 ppm. Recirculation rate was 15 to 1. Intermediate sedimentation between the filter stages was recommended. The lowest op-

erating cost and most trouble-free operation was produced by these three and each would produce an effluent with an average final BOD of 30 ppm.

In another instance, penicillin beer averaged 13,000 ppm BOD and streptomycin wastes 2500 ppm. The two wastes, combined with domestic sewage from a population of 4000 persons, were treated in a plant with holding tanks, aeration for the penicillin wastes, primary settling, trickling filters, secondary settling, chlorine contact chambers and sludge handling units. Filter feed was diluted with recycled final effluent and applied to the trickling filters at loadings of 4.0 mgad. This reduced the BOD an average of 90 percent.

Chewing Gum Factory Wastes: These wastes are high in total solids, averaging 14,000 ppm, and relatively high in BOD, averaging 3800 ppm, with a pH around 10.5. It has been demonstrated that these wastes can be handled in a plant comprising pre-digestion, settling, high-rate trickling filters with recirculation, sand filters and final settling.

Dreyfus & Co., South Plainfield, N. J., installed a plant with equalization tank, pre-digestion, trickling filters with recirculation, final mechanized sedimentation units and sand filters. The raw waste had a BOD of 1500 to 2000 ppm. The average daily flow of 20,000 gallons is combined with about 8000 gallons per day of domestic sewage from the plant. Average data for one month showed the following: Flow, process waste, 17,160 gpd; Flow, domestic sewage, 8000 gpd; BOD, process waste, 1838 ppm; BOD, digester effluent, 741 ppm; BOD reduction by pre-digestion 60 percent; domestic sewage BOD, 240 ppm; BOD, clarifier influent (digester effluent plus sewage) 582 ppm; BOD, clarifier effluent, 327 ppm, a reduction by the clarifier and filter of 44 percent; sand filter effluent BOD 129 ppm; overall BOD reduction by plant, including the domestic sewage, 90.1 percent.

Radioactive Wastes: The only wastes from atomic energy plants that have been found responsive to treatment on trickling filters are the discharges from the laundries where the protective garments and equipment worn by the operating personnel are cleaned. First step is a holding tank to permit uniform flow to the filters. Two-stage trickling filters with recirculation will remove plutonium from such wastes in a manner comparable to chemical

treatment, and will oxidize the BOD. A loading of 0.3 mgad, with BOD loading of 150 pounds per acre-foot produced an effluent with a BOD of around 2.0 ppm. Best results were obtained with series operation of filters with recirculation of 6 to 1 in each phase. Initial recirculation rates of 15 to 1 were used to tone up the filter.

Phenolic Wastes: Dow Chemical Co., Midland, Mich., has developed the outstanding installation for this type of wastes. Wastes with a phenol content of 700 ppm and a flow of 1.5 mgd are settled and mixed with 13.5 to 23.5 mgd of weak wastes containing 1 to 5 ppm of phenol. The mixture is neutralized, settled, applied to trickling filters and followed by a step of activated sludge. The plant, excluding the final effluent ponds, removed from 76 to 92 percent of the phenol. Including the added work done by ponds, an overall removal of phenol of 94.6 to 99.3 percent was attained.

Hercules Powder Co. has used biological treatment successfully on wastes containing formaldehyde, resin oil, phenols, organic acids and pentaerythritol. After elimination and re-use of some of the wastes, the formaldehyde concentration was reduced to an average of 1300 ppm, equivalent to 600 pounds of BOD per day. Filter loading of 2.8 pounds BOD per cubic yard was used. High recirculation rates were used and the concentration of formaldehyde applied to filters was about 200 ppm. An overall efficiency of 76 percent was reported.

Vegetable Dehydration and Freezing Plant Wastes: These wastes contain a high percentage of vegetable origin solids in fine suspension and can be adequately treated, together with municipal sewage, on high rate trickling filters at loadings of 6 to 10 pounds of BOD per cubic yard when the filters are preceded by vacuum flotation or other means to remove the considerable bulk of the fine solids.

Corn Starch Plant Wastes: Recoveries of starch and feed stuff from these wastes has materially reduced the volume and strength, but the final wastes contain organic solubles from the corn kernels and corn syrup and are amenable to treatment by sedimentation and trickling filters.

Candied Fruit Factory Wastes: These wastes contain large quantities of sugars in solution and have an average BOD of 7500 ppm. Here, as in distillery wastes, pre-digestion is effective as the primary stage. The wastes, being in small volume, may be mixed with domestic sewage and handled by normal processes. Single-stage filters may be used; two-stage filters with intermediate sedimentation produce an effluent equivalent to that from the single-stage plant, but with the ability to handle loads of up to three times that possible on the single unit.

Sulphite Liquor from Paper Pulp Manufacture: Waste sulphite liquor can be handled on trickling filters with a BOD reduction of 65 to 75 percent but trouble with clogging has been experienced. The trickling filter treatment is expensive as very large areas of filters are required to handle the wastes of a 100-ton per day pulp plant.

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Television Ratings

(*Continued from page 65*)

sumption, the ratio of domestic use of water over industrial use, the interest-intensity and the duration of the program, so that the "W" rating can be applied to any community where the variations in the municipal water flow and/or the

water pressures can be measured and recorded.

The City of Toledo has only one Television station, namely, WSPD-TV, which has only limited competition, from nearby Detroit's four stations. Hence, as in all single station communities, the formula or rating can be most readily and accurately applied. In cities or large communities having two or more local TV stations, the formula for the rating can be adjusted in its factors or used in connection with some other type of research to bring the desired results.

The rating in itself has the distinct advantage of resulting from the entirely voluntary, unsolicited for, and unconscious participation of the public in producing the data needed for its computing. It has the further advantage that it can be produced, if necessary, within a matter of a few hours after the termination of the program that is being rated, thus avoiding the long delay and waiting necessary with other types of ratings, so that even the same program in the same community can, with reasonable accuracy, be rated from week to week as to its possible increase and decrease in popularity with certain changes in the material or in the manner it is presented.

Graphs and analysis sheets have been worked out by the writer to show the relative popularity of Toledo programs for five week days and two Sundays as indicated by the water consuming public of the Toledo Metropolitan Water district. The highest rating has been reached by "I Love Lucy" which was rated at "W" equals 132.2 for Monday, November 24. The next highest was the TV Playhouse program on Sunday, November 23, with a rating of "W" equals 107. The TV Playhouse program on Sunday, November 30, showed a rating of 91.8.

Other features of interest to the person analyzing the pumpage and pressure curves are the manner in which some programs command immediate interest, while others apparently draw people's attention more slowly. This is shown by our comparison of the pumpage curve during the "I Love Lucy" program, 9:00 to 9:30 PM on Monday, November 24, with that of "Ed. Sullivan", 8:00 to 9:00 PM on Sunday November 23. It will be noted that because "I Love Lucy" is the type of program that is intensely interesting and must be attended right from the start to receive full appreciation of the particular act shown for

the evening, it receives immediate attention from the greatest number of people as indicated by the immediate and intensive drop of the pumpage. The "Ed. Sullivan" program because of its rather lengthy introductory commercial and program announcements, plus the fact that it consists of a series of acts, which do not necessarily have a continuity, has a rather slowly increasing attraction to draw the viewers back after their in-between-program activities.

The effect of commercial announcements and their ability to hold or not to hold the viewers and listeners can at times also be recognized in the lengthy programs. This is indicated by the curves for the "Arthur Godfrey" and TV Theatre programs of Wednesday, November 26, where a small increase in pumpage occurred near the half hour period, indicating that a limited number of viewers did leave after the first half of the show only to return almost immediately to attend the second half. On the same date the effect at the end of a boxing bout at approximately 10:50 was clearly shown.

Attention Sports Fans

Editor's Note: Mr. Van Dorp reports that a new high rating of 169.6 points was recorded for the recent championship bout between Chuck Davey and Kid Gavilan. This compares with 145.0 for Charles vs. Walcott in June, 1952; 71.8 for Davey vs. Graziano in September, 1952; and 123.8 for Moore vs. Maxim in December, 1952. The pumping rate chart made during the Davey-Gavilan bout is a jagged line with small peaks indicating the one-minute intervals between rounds. These show up quite clearly in the chart forwarded to us.

• • •

"Doc" Symons

(*Continued from page* 18)

FSIWA Exec. Secy. Homer (Pete) Wisely told me the registration at the meeting was 1152—a record.—But at the NYSIWA Meeting in January, Lou Fontanelli of Rahway, N. J., the Vice Pres. of FSIWA said the registration at the Federation Meeting in October was 1144—That's still a record but "wha happen" to those other eight?

★ ★ ★

Hats Off To — C. G. (Charlie) Richardson, V. P. of Builders-Providence, Inc. In mid-February Charlie

completed 50 years with Builders Iron Foundry (and its Div., Builders-Providence) and started on his 51st year.

I first met Charlie about ten years ago, but then he had only been serving the fields of water and sewage treatment for four decades. Other persons may think of him as an inventor of flow measuring devices, as an author of more than 50 articles, as a mathematician, as a historian, as a humorist (you should hear his talk on Patented Humor), as a church deacon, as a Mason, or as a loyal Alumnus of Brown Univ., but I like to think of Charlie Richardson as a man I'm proud to call, Friend.

★ ★ ★

It's An Idea — There are many jokes about committees, like: "A committee is a group of men who individually can do nothing but as a group can decide that nothing can be done"—or—"A Committee is a group of the unfit, appointed by the unwilling to do the unnecessary."

But many committees do things that individuals could never do so well. On the other side of the Atlantic Ocean, they call a committee a "Working Party"—Not a bad idea!

★ ★ ★

News Notes From Brushy Bend — The Northwest Section of the Ohio AWWA held a mid-session meeting at Deshler, Ohio on Jan. 20. Subject of the Panel Discussion was Zeolite vs. Lime Softening. Inspection of the Light and Water Plant was on the program for the afternoon from 2 to 6 pm. with "luncheon" at $1.25 per plate at 6 pm followed by the panel discussion.

The 15th annual meeting of the Northern Section of the Illinois Sew. and Ind. Waste Treatment Operators Conference was held in Rochelle, Ill., last October. The meeting was held across the road from the Sewage Works—at the Country Club. Chairman is Walter Bengson of Round Lake San. Dist., and Secy. is Paul R. Carlson of Rockford San. Dist.

The annual five-day short course for water works operators in Illinois is scheduled for Mar. 9-13 at the University in Urbana, Ill. Registration is limited to 18 because of the type of instruction given and facilities available. At a $10 registration fee, a very good course is available, very inexpensively.

★ ★ ★

See you in Grand Rapids—I hope.
V.T.Y.—Doc Symons

Public Works EQUIPMENT NEWS

Teale dozer-loader.

Dozer-Loader for Installation on Crawler Tractor

This dozer-loader can be readily installed on and demounted from a regular crawler tractor, without modifications in the tractor. Bucket capacities are $\frac{5}{8}$, $\frac{3}{4}$ and 1-yard, and the buckets raise to $8\frac{1}{2}$ ft. Operation is hydraulic. The bucket fits close to the front of the tractor for better leverage and lifting power, and cuts below the tractor tracks. More from Teale & Co., Box 308, Omaha, Nebr.

Use coupon on page 32; circle No. 3-1

Fre-Lite Highway Signs Combine Day and Night Usefulness

Relying on the laws of physics to gain brightly colored light, these Fre-Lite signs do not contain fluorescent or luminous materials. They present a good appearance under normal daytime lighting and strong visibility at night by utilizing reflected light. They have unusual durability. Best application is to metal, wood or cardboard base. Interesting data from H. K. Ashley, 2305 Cherry St., San Leandro, Calif.

Use coupon on page 32; circle No. 3-2

Controlling Algae and Slime in the Swimming Pool

Algaedyn, it is claimed, will make your swimming pool water clearer because it kills and controls the growth of algae, scum and slime. The principal component of this compound is Movidyn, a colloidal silver. It comes in liquid form and one gallon to 50,000 gallons of water is the recommended dosage, with small added treatments thereafter. U. S. Movidyn Co., 863 N. Orleans St., Chicago 10, Ill.

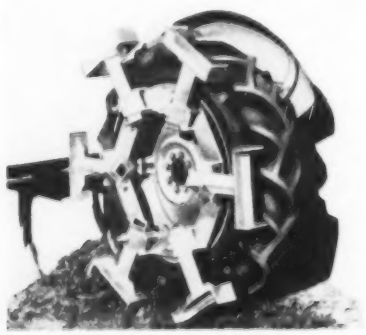
Use coupon on page 32; circle No. 3-3

Hi-Tender is truck-mounted.

"Hi-Tender" for Tree Trimming and Light Maintenance

A cage on a truck-mounted mast, with hydraulic controls in the operator's cage, greatly expedites off-the-ground work, such as trimming of trees and maintenance of street lights. Rotation of 360° is possible, and reaches of 30 to 60 ft. in elevation, with considerable lateral reach, depending on the length. Fits any standard truck chassis. More from Stemm Bros. Inc., Leavenworth, Wash.

Use coupon on page 32; circle No. 3-4



Makes wheels take hold.

Better Power for Rubber-Tired Tractors

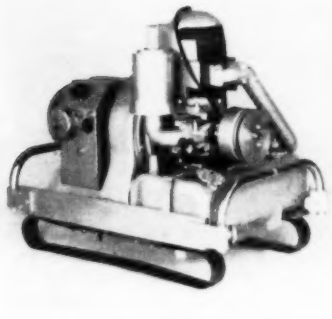
To help a rubber-tired tractor operate efficiently in mud, snow, ice and sand, Vise-Grip lugs are available. Only four minutes are required to extend or retract the lugs. Tests on a farm tractor showed drawbar pull was increased from 2000 to 5200 pounds in sandy loam. The lug bolts on the outside of the tractor wheels and are extended or retracted as needed. Comco, Box 983, Kilgore, Texas.

Use coupon on page 32; circle No. 3-5

Water Treatment for Iron and CO_2 Removal

This is stated to be an innovation in single-pumping, pressure treatment of water by means of an "oxidator", which separates the water into minute particles and treats these with free oxygen. Units are said to be producing excellent water from a raw water that contains as much as 50 ppm of iron and 300 ppm of CO_2. The design is compact. Fuller data from Sherwood Water Treatment Co., Palmyra, N. J.

Use coupon on page 32; circle No. 3-6



5-kw Homelite generator

5-KW Dual Voltage Portable Electric Generator

This new dual-voltage generator by Homelite will carry a continuous load of 5,000 watts, single phase AC to either 115 or 230 volts. Weight is 228 pounds. It has enough power to operate electric saws, grinders, drills, routers, tampers, etc., and for emergency lighting and standby power for communications companies, homes, farms and night construction work. More from Homelite Corp., Port Chester, N. Y.

Use coupon on page 32; circle No. 3-7

Snow Plow Attachment for Fork Lift Truck

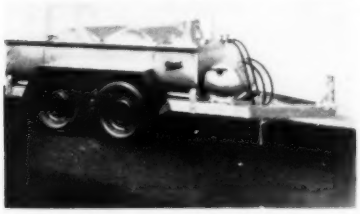
The Tracto-Lift heavy duty industrial tractor can now be provided with snow plow attachments so that either V or blade snow plows can be used with this unit. The V plow cuts to a width of 60 inches; the blade plow is 84 inches long and is adjustable to many angles, permitting also piling to either side. Operation is smooth even over rough terrain. Data from Tracto-Lift Co., 800 E. 18th St., Kansas City, Mo.

Use coupon on page 32; circle No. 3-8

Snow plow attachment

"Jumbo" Size Asphalt Melting Kettles

There are two models of this new "Heet-Master" asphalt melting kettle, 375 and 500 gallons capacity. The kettles are mounted on pneumatic tires for faster travel to and from the job. Special features include a double tube heating system which insures hot material in a very short time after the burner is started; low loading height; low center of gravity; load equalizers; short turning radius; lockable rain covers; and adjustable tow eye. They will go wherever a truck can be driven. More from Aeroil Products Co., So. Hackensack, N. J.



Large Aeroil kettle

Use coupon on page 32; circle No. 3-9

Bigger Bulldozer for Use with Bigger Tractors

In cooperation with Allis-Chalmers, Baker has brought out the hydraulic no-pushbeam 96-inch wide bulldozer integral with the HD 15 crawler tractor and has named it the Baker 15X. This bulldozer cuts 15½ inches below ground and up to a maximum of 39½ ins. above ground. Capacity is surprising; weight is 5366 pounds. Complete details of specifications and performance from Baker Mfg. Co., Springfield, Ill.

Use coupon on page 32; circle No. 3-10

Big Baker bulldozer

This is Practically a Portable Paint Shop

Entirely self - contained and mounted on a high-speed 4-wheel trailer, this spray painting outfit is equipped to go anywhere and handle practically any spray painting job. It will operate from one to three spray guns simultaneously. Air and fluid are carried through 100-ft. hoses wound on a reel, which are unreeled as needed. More data from Universal Sales & Mfg. Co., 5211 Pacific Blvd., Huntington Park, Calif.

Use coupon on page 32; circle No. 3-11

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4-Wheel Drive and Steer Front End Loaders

Two new 4-wheel planetary drive and 4-wheel power steering front end loaders, the Scoopmobiles LD5 and LD10, are now available. The LD5 has a bucket capacity of ¾ to 1-yd.; the LD10 a capacity of 1⅝ to 2-yd. The bucket is hydraulically operated to provide better and faster loading. Discharge height of the bucket is 8½ ft. for the smaller and

New front end loader

9 ft. for the larger model. There are eight speeds forward and back. Diesel power is optional; tires are pneumatic. More from Mixermobile Mfrs., 8027 NE Killingsworth St., Portland, Ore.

Use coupon on page 32; circle No. 3-12

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Something New in the Rat Control Field

This is a new rodenticide, just registered with the USDA, which is said to work on a new, and very effective principle. This rodenticide is furnished in six flavors and odors; the range of flavors cover the principal likings of rats. Rat Krax, made in these six flavors, is furnished in 1 lb. containers which serve as bait cans. No mixing is required—the lid is removed and that is that. Information from Koch Supplies, 2520 Holmes St., Kansas City 8, Mo.

Use coupon on page 32; circle No. 3-13

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Handy Scraper for Ford and Ferguson Tractors

The design of this ¾-cu. yd. McGee scraper for use with Ford and Ferguson tractors is such that the operator can adjust the tilt of the scraper for scraping, backfilling, scarifying or scarifying and scraping without getting off the tractor. This speeds up the work. Both cutting and backfilling blades are 5½ feet wide. Control is hydraulic. Data from Earth Equipment Corp., 2036 Sacramento St., Los Angeles 21, Calif.

Use coupon on page 32; circle No. 3-14

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Galion Graders Available with GM Diesel Engines

General Motors 2-cylinder diesel engines are now available in Galion Nos. 104 and 118 motor graders, in addition to the International Harvester diesel engines previously used. The 104 grader has a diesel rated at 85 hp; the 118 has a 104-hp engine. Full data on these graders, with either type of power, are available from Galion Iron Works & Mfg. Co., Galion, O., or any Galion distributor.

Use coupon on page 32; circle No. 3-15

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3/8-Yd. 6-Ton Truck Mounted Shovel Crane

This new heavy-duty Bantam shovel-crane can be mounted on any tandem-axle truck, new or used, that has a wheelbase of 164 ins. or more; and suitable single-axle trucks may also be used under favorable conditions. Attachments include shovel, clamshell, dragline,

Schield Bantam crane

backhoe, magnet, wood grapple and pile driver. There are many improvements in this model. More from Schield Bantam Co., Waverly, Iowa.

Use coupon on page 32; circle No. 3-16

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Labyrinth Type Waterstop Saves Money

The plastic ribbed Harza labyrinth type waterstop was used with much success on the new water filtration plant of the St. Louis Co., Mo., Water Co. This waterstop is simple to install; in many cases it can be nailed to a board and the concrete poured around it. When the adjoining concrete is poured, the waterstop insures a tight joint. The stop will not tear or bend and it can be welded with a knife or blow-torch. It does not interfere with placement of steel. Full data from Water Seals, Inc., 9 So. Clinton St., Chicago 6, Ill.

Harza waterstop

Use coupon on page 32; circle No. 3-17

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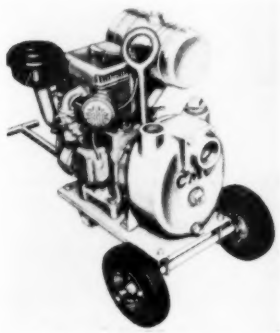
Portable Self-Priming Centrifugal Pumps

These new pumps are made in four sizes and seven models, all powered with air-cooled gasoline engines. Sizes range from $1\frac{1}{2}$ throug 4-inch. In design, attention was given to reduction in the number of parts and a consequent lesser weight, which has been reduced about 25 percent. Pumps are close-



Portable centrifugal

PUBLIC WORKS SUPT. WANTED

Applications are being accepted for the position of Public Works Superintendent for the City of Woodstock. Position which is being considered under reorganization includes water, sewer and street departments. Applications or request for additional information should be sent to L. M. Lovejoy, City Manager, Box 190, Woodstock, Ill.

REPRESENTATIVES WANTED

Fifty-two year old company has some territories available. Regular contacts with cities and counties considered important. Product: new improved reflective sheeting for street and highway signs. Write for particulars.

Grote Manufacturing Co., Bellevue, Ky.
(Opposite Cincinnati)

INDEX OF ADVERTISEMENTS

WATER TREATMENT SALES ENGINEER
For Municipal Works

Large Western manufacturer of water & waste treatment equipment has position open for a Department Engineering Sales Manager thoroughly experienced in field of municipal water treatment. Salary commensurate with experience & ability. Replies held confidential. Box # 3-13

ELGIN Jr. STREET SWEEPER, mdl. F, w/gutter broom, rebuilt, late model, bargain. $1350. Rental apply purchase price GUTTERSNIPE SWEEPER, w/gutter broom, late model, rebuilt. $950 Will rent apply towards purchase price.

Wenzel Machy, Rental & Sales
2136 Jefferson St. Kansas City, Mo.
Phone: Harrison 0021

coupled and are mounted on rubber-tired wheels or skids. More from Construction Machinery Co., Waterloo, Iowa.

Use coupon on page 32; circle No. 3-18

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Masonry Drill Permits Continuous Drilling

Dust packing, which causes stalling in masonry drills, is overcome in this drill. The design of the drill flutes and lands results in carrying the dust up and out of the hole as fast as it forms. The drill can be used with any tool. It is made of a very tough alloy steel and has a carboloy tip. Sizes range from 11/64 to 1-1/2 inch. Data from Holub Industries, Sycamore, Ill.

Use coupon on page 32; circle No. 3-19

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Friction Driven Light Weight Material Spreader

In this simple material spreader, drive is by friction wheel and speed of rotation of the spreader disc is controlled by adjusting the position of the drive wheel on the axle. A cone controls the quantity of material reaching the spinner. Works equally well, forward or reverse and operates only when the truck body is raised. Spreads 8 to 24 ft. Weight is 212 pounds. Data from Wausau Iron Works, Wausau, Wisc.

Use coupon on page 32; circle No. 3-20

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Cost of Garbage Collection and Disposal

Based on a 1951 population of 637,942, the combined net cost of the collection and disposal of garbage and waste oil, and the disposal of plant residue, in Milwaukee was $2.13 per person. This included administrative costs.

• • •

Highest Grade Water Works Engineer and Administrator Is Available

There is available a skilled and experienced water works engineer and administrator. He is presently the directing head of a large and successful municipal water works system, with control over all of its operations. He desires a fuller opportunity for service in his chosen field. He is active, widely and favorably known in water works circles. For more information, write Box W, in care of the Editor of Public Works. Communications will be forwarded without acknowledgment from this office.

ASSOCIATIONS

For the American Water Works Association convention in Grand Rapids, a special train can be provided if there is sufficient demand for it. To provide for such a train, reservations should be made before April 1. All correspondence regarding reservations should be addressed to E. A. Sigworth, Suite 1333, 230 Park Ave., New York 17, N. Y.

The Southern Association of Science and Industry will hold a special 2-day regional conference in the near future. The industrial waste problems of the south will be given special attention. Fuller data on the meeting can be obtained from the Association at 5009 Peachtree Road, Atlanta, Ga.

New Trucks Announced by IHC

A COMPLETELY new line of light, medium and heavy-duty motor trucks has been introduced by International Harvester Company. A high degree of truck-to-job specialization is possible, with 168 basic chassis models in 296 wheelbases, and with gross vehicle weight ratings from 4,200 to 90,000 lbs. included in the company's new R-line. There are 29 engines—gasoline, LPG and diesel—with horsepower ratings ranging from 100 to 356, and a wide selection of transmissions, auxiliary transmissions, axles and axle ratios.

Among the new models announced is the R-210, a 157-in. wheelbase truck with refuse collection body for municipal service; the model R-184 Loadstar, a 142-in. wheelbase truck with 4-yd. dump body and the model 164 Loadstar with 2½-yd. dump body; and the model R-120, 127-in. wheelbase truck with 89-in. Service-Utility body. Service-Utility bodies are matched to the chassis and designed specifically for on-the-job service or utility work.

International R-line trucks are newly identified by the distinctive IH emblem, replacing the Triple Diamond. Styling is new. The overall line offers 307 new features developed at International's Fort Wayne, Ind., engineering and test laboratories and proved at its Phoenix, Ariz., Proving Ground.

● Here are three of International's new trucks: At top, the R-184 Loadstar with 4½-yd. body; above left, the R-210, and right, the R-120 utility body.

Worth Telling

by Arthur K. Akers

★ President **WALTER E. IRVING,** of the IRVING SUBWAY GRATING COMPANY, Long Island City, N. Y., has been awarded an Army Certificate of Appreciation for his pioneering in the development of portable steel landing mats.

★ **MOTOROLA** news includes organization of a wholly-owned subsidiary to be known as MOTOROLA COMMUNICATIONS AND ELECTRONICS INC. JOHN SILVER formerly general manager has been promoted to vice-president in charge of operations of this division.

★ **AT JOSEPH DIXON CRUCIBLE COMPANY** (Paints) E. C. BEAM and R. E. GOODFRIEND become district supervisors at Chicago and Columbus, Ohio, respectively.

★ **H. G. WOOD** is new district engineer of the Columbus, Ohio, office of the PORTLAND CEMENT ASSOCIATION.

★ **SHERMAN PRODUCTS Inc.,** Royal Oak, Mich., has named J. K. van LEEUWEN eastern regional sales

Mr. Van Leeuwen

Mr. Stone

manager, supervising all sales east of the Mississippi. C. L. STONE is appointed in similar capacity for west of that river.

★ **THE FOXBORO COMPANY,** instrumentation, keeps expanding. Now it's a new branch in Wichita, Kansas, under DALE C. HUGLEY; and a plant extension at Montreal.

★ **The MONTCLAIR (N. J.) TIMES** of January 22 carried a feature story on the 88th birthday of A. PRESCOTT FOLWELL, still active in the editing of PUBLIC WORKS. Mr. Folwell remains more concerned with the future than the past, so we here at PUBLIC WORKS are planning for the celebration of his 90th anniversary rather than dwell now on his youthful 88th!

★ **CATERPILLAR TRACTOR** has created the new position of assistant director of sales, filled now by J. J. VALENTINE and W. S. ZEIGLER and with the addition of J. W. MOHLER, back from the NPA in Washington.

★ **EARL H. BRADLEY** is the new president of BUILDERS IRON FOUNDRY, Providence, succeeding HENRY S. CHAFEE, Jr., who remains as treasurer. GEORGE W. KELSEY has been advanced to president of BUILD-

Mr. Bradley

Mr. Kelsey

ERS-PROVIDENCE, Inc. Both have been associated with BUILDERS over many years and both have long and impressive business records that we only wish there was space to chronicle here.

★ **CONTINUING** our February mention, WILLIAM E. CLOW, Jr. has been elected chairman of the board of JAMES B. CLOW & SONS, Chicago. JOHN MADDEN succeeds KENT CLOW, deceased, as president.

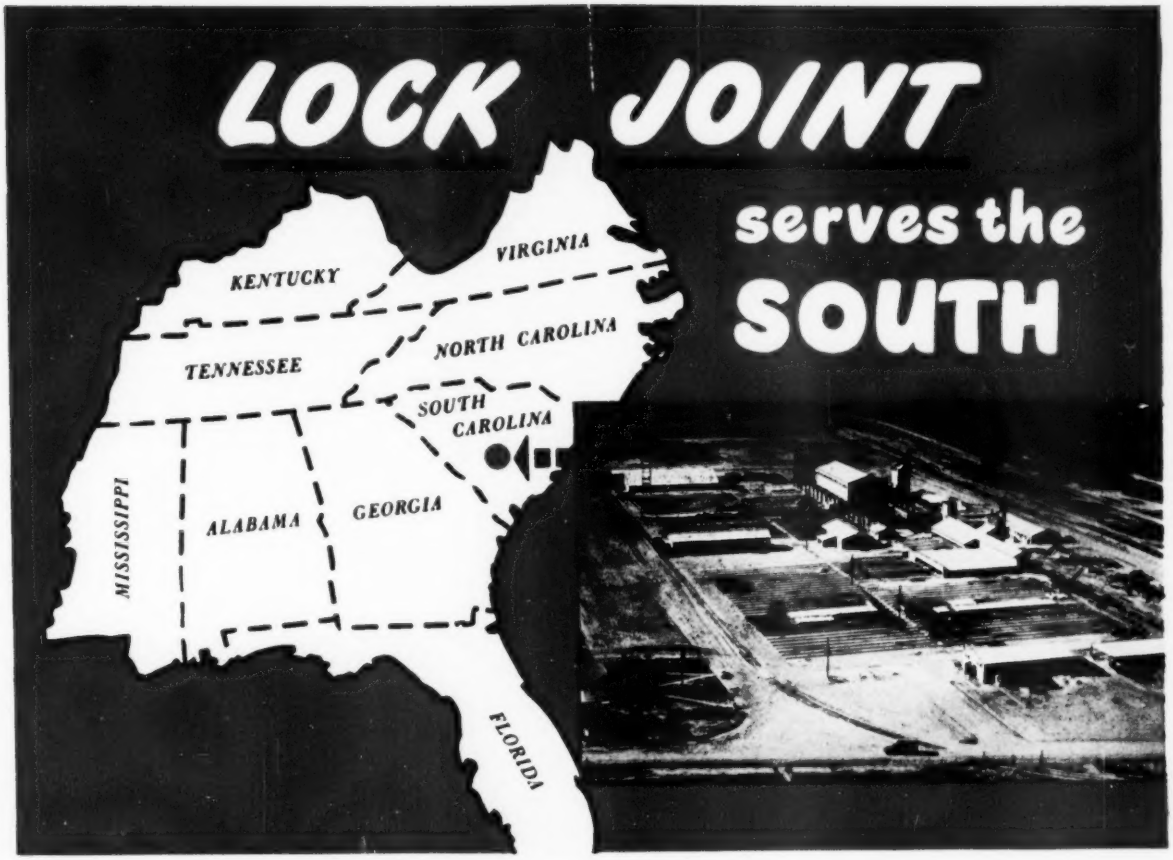
★ **J. H. KING** succeeds L. C. LOBB as central Ohio sales representative for THE GALION IRON WORKS & MANUFACTURING COMPANY, Galion, Ohio.

★ **NOW** it is BRIGGS & STRATTON CORPORATION, turning out in 1952 their one-millionth engine for that single year. That's what our colored friends in Alabama would term "a whole mess of engines."

★ **BETWEEN** talking too much and talking too little, remember that more parrots have had their necks wrung than owls ever did.

Universal Concrete PIPE DREAMS

LOCK JOINT serves the SOUTH



IF YOU'RE FROM THE SOUTH . . .
specifically Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Kentucky or Tennessee . . . our plant at Columbia, South Carolina, is ready and waiting to serve you. This Columbia plant, the fourth of our up-to-date permanent pressure pipe manufacturing yards, is equipped to produce Lock Joint Prestressed Concrete Cylinder Pipe in diameters from 16" to 48", designed for any pressure common to water works practice. The plant's central location in the Southeast makes it possible to deliver the completed pipe speedily and economically throughout this area.

IF YOU'RE FROM ANY OTHER PART OF THE COUNTRY EAST OF THE ROCKIES . . . our three other permanent pressure pipe plants located at Wharton, N. J.; Detroit, Mich.; and Turner, Kansas, stand ready to provide for your complete Reinforced Concrete Pressure Pipe requirements. All these plants are equipped to manufacture the most carefully designed modern Concrete Pressure Pipe in a large range of standard diameters, and have facilities to handle any contract however large or small.

SCOPE OF SERVICES—*Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains 16" in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.*

LOCK JOINT PIPE COMPANY
Established 1905
P. O. Box 269, East Orange, N. J.
PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan., Detroit, Mich., Columbia, S. C.
BRANCH OFFICES: Casper, Wyo. • Cheyenne, Wyo. • Denver, Col. • Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. • Wichita, Kan. Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex. • Oklahoma City, Okla. • Tulsa, Okla. • Beloit, Wis. • Hato Rey, P. R. • Caracas, Venezuela

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

there's an easier way

TO OPERATE A SEWAGE PLANT, TOO

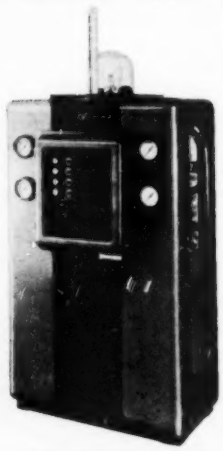
Modern equipment, such as a new W&T Visible Vacuum Chlorinator equipped for automatic or program control, can facilitate the job of operating almost any sewage plant.

For example, take a look at some of the jobs a W&T Chlorinator can do — and do well.

- Disinfect Effluents
- Control Odors
- Reduce Hydrogen Sulfide
- Prevent Sludge Bulking
- Reduce B.O.D.
- Improve Sedimentation
- Minimize Grease Content

Moreover, a W&T Chlorinator will ensure dependable, accurate chlorination with a minimum of attention and maintenance — another factor all operators appreciate.

S-71



W&T PROGRAM CONTROL
VISIBLE VACUUM CHLORINATOR

WALLACE & TIERNAN
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